HCI Master’s Project Final Report

SocialConnect: An At-Home Tool to Empower In-Person Socialization for People Diagnosed with Mild Cognitive Impairment and their Care Partners

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Duration
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INTRODUCTION & BACKGROUND

Motivation - *What is MCI? Why is it important?*
Mild Cognitive Impairment (MCI) is a form of cognitive decline that is marked by a level of cognitive functioning which is lower than that of normal aging but not as significant as that of dementia (see Figure 1 below). Those diagnosed with MCI can either experience memory loss (called amnestic MCI) or cognitive ability loss such as impaired decision-making (called nonamnestic MCI). While the effects of MCI are noticeable in that they affect peoples' ability to do complex tasks or engage with others, people diagnosed with MCI are still able to carry out the activities of everyday life, such as dressing, feeding themselves, eating, toileting and bathing. Statistically, in the United States, approximately 12-18% of people age 60+ have MCI, and about 10-15% of those individuals develop some form of dementia each year. Despite this prevalence, however, over 80% of Americans know little about or are completely unfamiliar with MCI (Alzheimer's Association, 2024).

Furthermore, it has been found that interventional support in the form of lifestyle interventions both before diagnosis and early on after diagnosis can halt or reverse the progress of the disease, as shown by the yellow dotted line in Figure 1. These supports can take many forms, such as engaging the mind through learning new skills, exercising regularly, eating a healthy diet, and keeping up with social interactions (Stepko, 2022). It is therefore essential to address this diagnosis to not only support the growing population of people with it but to create greater awareness for it so that people are equipped with the knowledge necessary to prevent and address this diagnosis in their own lives.

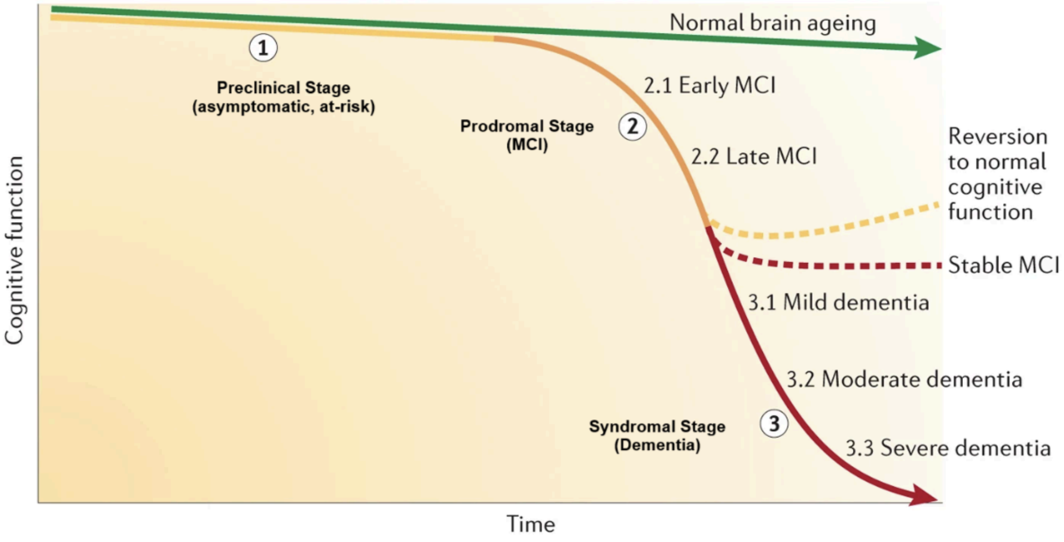


Figure 1: Graph from Hampel and Lista (2016) visualizing the stages of cognitive aging, including the various forms of MCI and dementia

Prior Work

The inspiration for working in this space came from the research Josey was engaged in starting the 2022-2023 school year through the NSF-funded AI-CARING Institute. This multi-institution collaborative aims to leverage a mix of quantitative and qualitative research methods to explore the potential for future AI-based technology to support the needs and challenges of people diagnosed with MCI and their care partners. The main driver and goal of the Institute at large is to create longitudinal systems that support folks such that they are able to age in place comfortably and successfully (National Science Foundation AI-CARING Institute, 2024).

Toward this end, Josey's work consisted of primary research via semi-structured interviews to understand the current needs, successes, and challenges of everyday life for people diagnosed with MCI and their informal care partners. This exploratory work yielded many insights about the lives of these two target user groups, but of the many insights gleaned from the collected qualitative data, we resonated with one theme in particular: social engagement. One user quote from those interviews that resonated with us and drove us to explore this space further was, "When [person diagnosed with MCI] was working with his company…all the people who you would say might be his friends…they're either his employee or…a person…who he's trying to get work from. So it's a different thing when he retires. It's more difficult for him...how can I help him make more friends that are really friends?" We recognized a clear need and desire amongst these two groups to find ways to enhance and encourage a stronger social network and be connected with opportunities for engaging with their current network and the greater community.

Literature Review

Driven by our initial interest in understanding this space, our literature review focused on current work and gaps in the spaces of supporting people with an MCI diagnosis, socialization for this user group, and what technology might exist that could support such socialization. We wanted to see if there are any current systems or deployable strategies that sit at the intersection of these spaces, and what gaps we might be able to target once we identified current products and findings.

For our first focus area looking into the MCI diagnosis as a whole, we found that it presents a unique opportunity within the journey of cognitive decline to encourage autonomous enrichment. Austrom and Lu (2009) point out that, "at this early stage of cognitive decline, PwMCI and their family members may have a critical window to address needs and…improve the quality of life for both PwMCI and their family members." It has also been identified that interventional systems have the ability to provide support for care partners, with Schulz and Martire (2004) reflecting on their research into dementia caregiving that, “understanding pre or early caregiving stages may enable us to develop preventive intervention strategies that protect the caregiver from adverse outcomes later.”

Building on these insights around the unique opportunity that an MCI diagnosis presents for exploring support solutions at an early stage of cognitive decline, we wanted to understand how socialization factors into decline and how others have approached social supports for people diagnosed with MCI and their care partners. While engaging in socialization has the ability to increase quality of life, it can involve complex actions that may be difficult for someone diagnosed with MCI to engage in. Lydon et al. (2022) recognizes this in pointing out that, “pwMCI may experience social disengagement due to cognitive challenges making it more difficult to have fulfilling social interactions.” Adams (2006) also found that social decline is one of the first markers that cognitive decline has set in, noting that, “apathy and withdrawal from social and leisure activities were found to be the most frequent among the early changes reported by caregivers, indicating that functional decline is perhaps more noticeable to the family than cognitive decline.” Changes in social engagement are also seen in care partners as a result of the decline of the person with MCI whom they support. Dean and Wilcock (2012) said of care partners that, “they described efforts to maintain patients’ previous level of function and activity through encouragement and by planning activities together. Some carers described the need to set aside additional time to devote to caregiving, for example by cutting back on…socializing outside the home.” This finding demonstrates that not only does an MCI diagnosis affect the social engagement of both the diagnosed individual and their care partner, but it puts a burden on care partners to overcome that lack of social engagement by finding new ways of encouraging activity.

Knowing that there is a demonstrated need to provide interventional support of a social nature for people diagnosed with MCI and their care partners, as a final step in our literature review, we explored whether there has been technology developed to address this key intersection. We found that, while technology to support social engagement for our target users has not been widely explored, it shows great potential. As Madjaroff and Mentis (2017) point out, “a mutually supportive technology…will allow for an adequate negotiation of autonomy and safety between the care recipient with MCI and their familial caregivers.” They recognize that any technology which serves to support someone diagnosed with MCI will inherently support the care partner in some way as well, and that balancing the separate but related user needs of these two groups is essential to implementing a successful technological intervention. Furthermore, in their review of studies exploring social engagement and technological intervention for people diagnosed with MCI, Lydon et al. (2022) found that, “The evidence about the effectiveness of social engagement interventions for PwMCI is extremely limited.” They go on to say that only two studies they reviewed considered social engagement for people diagnosed with MCI as an interventional method, and again only two, "used technology-mediated methods to deliver interventions, but the extent to which these technologies catered to the needs of older adults with cognitive impairment remains unclear." This underscores the need to not only explore the intersected space of technologies to support socialization for people diagnosed with MCI, but to do so with a user-centered focus to ensure any system that is created is done so with the expressed needs of these users in mind.

Studies such as I-CONECT out of OHSU are a good example of work that targets the intersection of MCI, socialization, and technology, but that does not center user needs in the process of developing the technology. As Yu et al. (2021) explains, the goal of the I-CONECT study, "is to investigate the extent to which online conversational interactions can prevent cognitive decline among socially isolated older adults with normal cognition or MCI," and it does this by examining, "whether conversations through user-friendly video chats with multiple trained conversational staff can enhance cognitive functions and emotional well-being." Although this work is important for understanding the effect of socially-driven technology on cognition for people diagnosed with MCI, its focus is clinical and therefore does not factor in the impact and importance of designing interventional technologies using user-centered methodologies. Our work then aims to address the intersection of our three key topic spaces - an MCI diagnosis, socialization, and technology - while also leveraging user-focused techniques to ensure that the resulting solution is one that users will be most likely to adopt in their daily lives.

Research Question

Our pre-existing understanding of this space from Josey's work with AI-CARING in combination with our literature review led us to the following research question which we explored in our various user-focused research methodologies:

How might we design a sociotechnical interface that empowers people diagnosed with MCI and their care partners to find, coordinate, and engage in social activities?

RESEARCH METHODS & DESIGN FINDINGS

Recruitment

Before we began recruitment for this project, we requested approval of our research protocol by the Georgia Tech Institutional Review Board. We were given exempt review and got approval under protocol number H23388 (see Appendix A). At this stage, we also drafted an exempt consent form, having gone into the approval process expecting exempt consent, which participants could read over and then verbalize their agreement to participate in our study (see Appendix B).

We utilized Josey's GRA connections with the Cognitive Empowerment Program (CEP) at Emory University for research recruitment. The CEP is a program that supports continuing research into MCI and provides participant education about managing the diagnosis. We got in contact with their administration and were allowed to set up a table and hand out flyers, as shown in Figure 2 below, about our project and get contact information from the CEP participants who were interested in speaking with us. We kept in contact with everyone who gave us their information and would reach out to them to help us throughout our research and design process.

PLEASE JOIN US FOR

DONUTS AND DISCUSSION

ABOUT THE STUDY

We are **Georgia Tech students** who would like to chat with you **at the CEP** to learn about how you **socialize** and currently enjoy spending time with others.

CONTACT

Josey and Dipti at
joseyAndDipti@gmail.com

FOR MORE DETAILS:

Please see the **Research Participation section** of the **MyCEP app**

Figure 2: Doughnuts and Discussion recruitment flyer

Methods Employed

We employed three different research methods to gain a clearer and more defined understanding of what is and is not working when socializing with an MCI diagnosis and how we could potentially improve this process. We first started with conducting two focus group sessions, which were used to narrow down the pain points our user group faced when trying to socialize and identify the areas we can target for potential solutions. We then moved on to two rounds of interviews. The first round was used to narrow down key user interests and needs in the spaces identified in the focus groups.

The goal of the second round was the same as the first round but with the addition of an imagined future discussion which included framing user needs within a technology medium and identifying key features to include in our prototype. Finally, we ended with two co-design sessions which prioritized involving our user group in the design process to create a paper prototype of the chosen solution and evaluate the level of importance they put on the key features identified during the interviews.

Focus Groups *(2 in total, 13 participants; 7 with MCI, 6 care partners)*
For our first research method, we split the sessions into three sections of "I like," "I wish," and "I wonder" (see Appendix C). For the "I like" section, we asked participants to think about aspects that they like about their current socialization habits and what their preferences are for spending social time. For the "I wish" section, participants thought about current socialization habits that they would want to change or improve. For the "I wonder" section, they thought about new ways to facilitate socialization that they are interested in, or may like, dislike, etc. For each section, participants first had 10 minutes of individual written reflection on sticky notes. After time was up, we collected all the sticky notes and organized them into clusters of similar ideas at the front of the room and spent 10 minutes discussing what they wrote down. While the participants were talking, we were taking notes on any points they brought up that we thought were interesting or could be important for later analysis. We conducted this research method twice, the first with four people with MCI and four care partners and the second with three people with MCI and two care partners.

After completing the two sessions, we transferred the notes we gathered into FigJam as shown in Figure 3 below. We combined both sets of notes into three large affinity maps, separated by the "I like", "I wish", and "I wonder" sections. We then voted across the three affinity maps on which topic ideas we found most interesting. From that, we came out with four main takeaways: (1) common experiences, which encompassed socializing with others who have experiences with MCI or other similar experiences in relation to age, race, etc., (2) shared hobbies which involve socialization through events like book clubs, (3) socialization around mealtime, and (4) educational activities. Moving forward with our project, we decided to focus on creating a solution that addresses (1) common experiences and (2) shared hobbies.

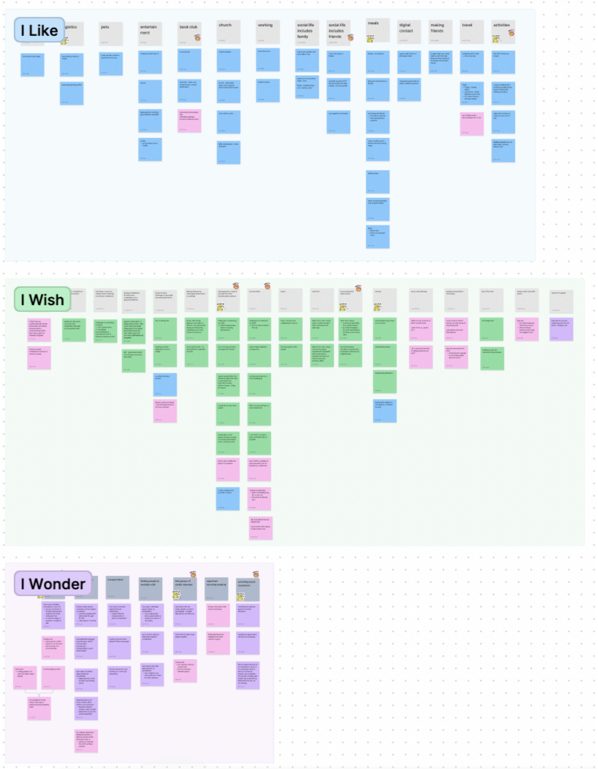


Figure 3: Affinity map

First Round Interviews *(2 in total, 4 participants; 2 with MCI, 2 care partners)*
The goal of our first round of interviews was to identify key user needs regarding their potential engagement in activities with others whom participants have common experiences and shared hobbies. To achieve this, a semi-structured interview script was created (see Appendix D) that was broken into two parts. First, the script sought to explore these topics by asking users whether they engaged in these kinds of activities, and if they did not, whether they wanted to. Then, based on the current experiences that participants expressed around these two activity themes, we would inquire on the "who, what, how" of these experiences. Who do they engage with (or would like to engage with more)? What enables them to do the activity (or hinders them from it)? How might preference accommodations change their experience? Regardless of their responses, we would end each dyadic interview by asking if a diagnosis of MCI has affected their ability to engage in the activities they mentioned.

Before conducting each interview, participants were also asked to fill out a Qualtrics demographic survey that included an exempt consent form agreement, and inquired about their basic demographics as well as their living situation, education, and marital status (see Appendix E). Demographics were chosen to be collected at this stage so that we could start to compare individual feedback to the dyads' unique circumstances, instead of collecting information in aggregate like we had done during the focus groups.

Interview Checkpoint - Outlining Our Modality

At this stage, we took a step back to assess what information we had gathered from our focus groups and first two interviews so that we could leverage our insights to engage in a unique approach to design ideation that we planned to implement during our second round of interviews. Our goal for design ideation was to involve users by building decision-making into the interview process, to ensure that the final modality was user-driven. Looking at all of the information we had gathered up until this point, we recognized three key factors that our final solution should include to address user needs. First, the form factor of the solution needed to be larger than a phone, because many participants reflected on the challenges and frustrations embedded in having to navigate such a small screen to do such a wide variety of tasks, such as communicate with other people. Second, the technology needed to be situated in the home, because even though folks indicated that they wanted to venture outside the home for their social activity, most people had a daily at-home routine that helped create structure in their lives and allow them to manage day-to-day activities. Third, the solution needed to be embedded in a familiar, everyday object, so that people would feel comfortable having it in their space, and they would be drawn to and encouraged to use it given its visual and structural familiarity.

Second Round Interviews *(3 in total, 5 participants; 2 with MCI, 3 care partners)*

Equipped with the context for how we imagined our final solution to be instantiated, we embarked on our second round of interviews. Here, we used the same script as the first round, but with an added portion at the end where we engaged participants in an imagined future discussion based on the key factors we identified for our solution. We gave users reference pictures for inspiration (see Figures 4 - 6 below) and asked them to imagine a product in their home with the specifications we identified (see Appendix D for full script of this final portion of the interview). These conversations allowed users to express to us in their own terms what they would and would not like about such a future opportunity, which gave us greater context about what key elements users were expecting to see and interact with on a device of this nature. Some of the preferences they provided included the option for multi-model engagement (i.e., through touch, talk, and motion), information about the weather and traffic, as well as key details and reminders about upcoming events, and photos of their family and loved ones.

Figure 4

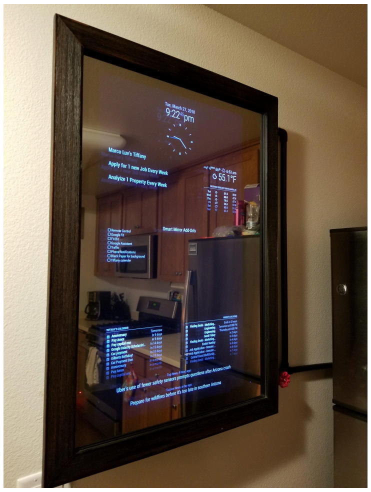


Figure 5

Figure 6

A Note on All Interviews

At the end of each interview, if the person with MCI was present, they were asked to leave and time was spent with just care partners to give them an opportunity to elaborate on or clarify anything said while the person with MCI was present. This was done in case any of the care partners felt more comfortable expressing certain things regarding the person with MCI in an individual setting. During this final portion of the interview, care partners were asked if they wanted to provide any additional information about what is or is not working with respect to the dyad engaging in social activity engagement. We also sought to understand whether social experiences have changed over time. This included questions about the dyad's preferences for socializing alone or together, and whether the care partner feels as though they act as an ad hoc social coordinator for the dyad. If they did feel this was the case, we then asked what their feelings are about that experience. If the person with MCI was initially present and had left the interview, the final question asked of the care partner would be a second inquiry on whether an MCI diagnosis had changed the dyad's social engagement, to give care partners a chance to further express their perspective on this topic if they felt they needed the opportunity to do so.

Data Analysis

Once we had completed all of our interviews, we added all of the notes we had gathered onto the same FigJam board where our focus group notes lived (see Figure 7 below). We organized them into categories based on what social activities participants mentioned, what went into planning for those events (or made planning challenging or even nonexistent), and what technology they may currently be using to plan for and engage in these activities. This insights table led to the identification of both functional and non-functional design requirements that our solution must address, as well as potential features that it should include to instantiate those design requirements as well as address user-identified expectations for this interface.

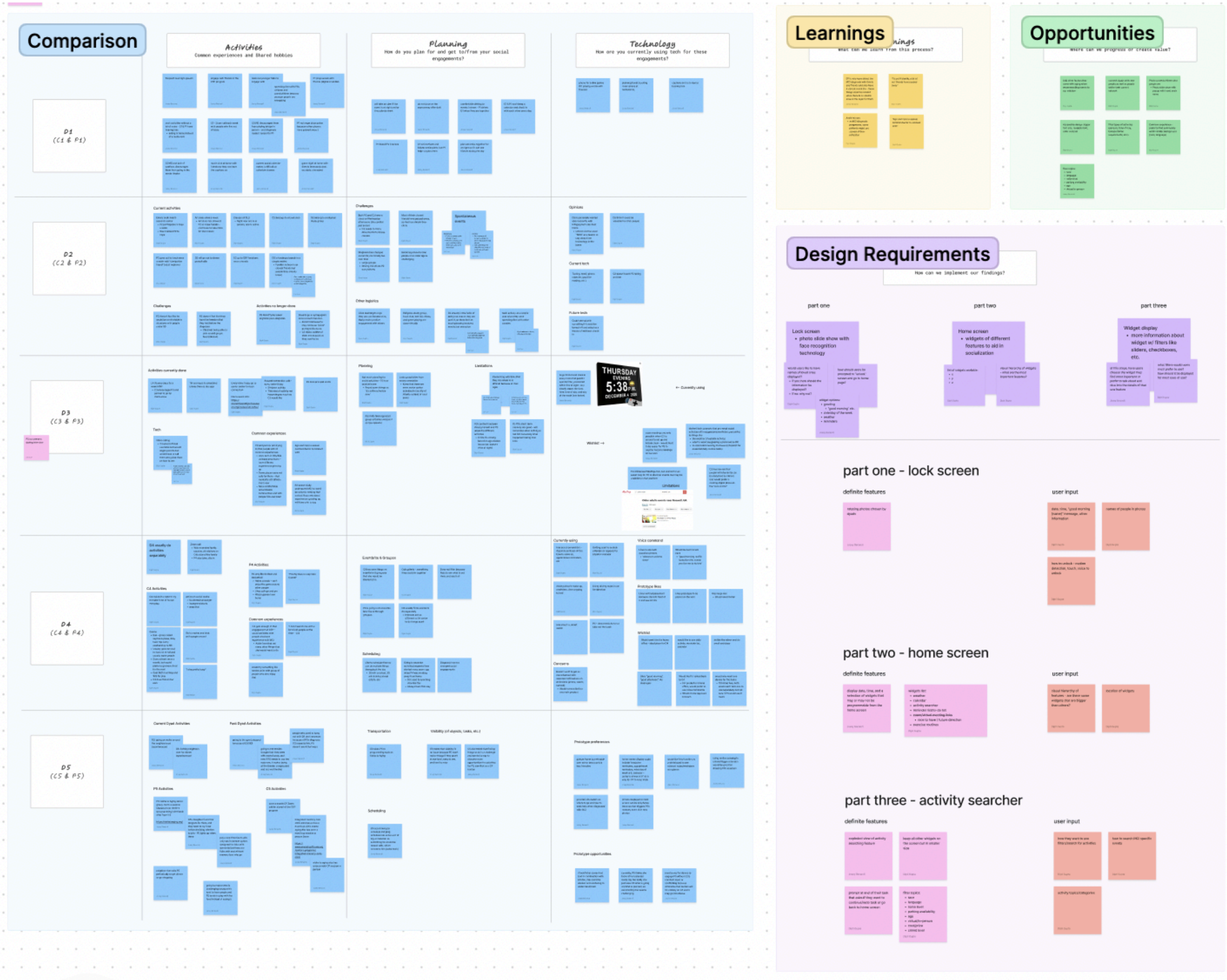


Figure 7: Figjam board of data analysis

Design Requirements

Functional

1. **Preference-Tuned**: The solution should include filters or recommendations for social events
2. **Simplified UI**: The solution should utilize large and easily distinguishable elements and high contrast colors
3. **Minimized Actions-Per-Task**: The solution should require minimal user actions to get from the beginning to end of a given task

Non-Functional

1. **Multi-User Compatible**: The solution should be easy to understand and use for both people diagnosed with MCI and their care partners
2. **Reminiscent**: The solution should help evoke memories and engage people with MCI in mental stimulation

Potential Features

1. **Activity Searcher**: This is the primary feature that we wanted to focus on and explore in our solution as it is the way in which we instantiate users' desire for easier means of discovery and engagement with events
2. **Calendar**: Included as a result of users' desire to integrate activities from a variety of sources into one central location
3. **Weather**: Included as a result of user's desire to have information that would help them in preparing to leave home
4. **Reminders**: Included as a result of user's desire to stay engaged with the day's activities on a consistent basis
5. **Photos**: Included as a way to instantiate reminiscence, not as a primary function of the interface but as a gap feature that users could engage with when not engaged in the other, more interactive features

Co-Design Sessions *(2 in total, 5 participants; 1 triad with 2 care partners, 1 dyad)*

Having established both the tangible and intangible elements that were essential to our solution, we decided to engage in a series of co-design sessions with our users to understand how they envisioned these various features and design elements to be imagined through the information architecture of the solution. To achieve this, we used a TV screen to approximate the size that we imagined our solution to be and cut out pieces of sheet paper to that size. We then created a grid on those sheets and cut out smaller pieces of paper that would fit within that grid to envision how something that likened an app or a widget could be displayed on this enlarged screen in a variety of sizes, from small squares to larger rectangles. We intentionally left these pieces blank so users could fill them in during the co-design sessions. The only visual we created beforehand to help users envision the final product was a sketched family photo so our co-design participants could get a sense of how it might feel to see their own photos displayed on a screen alongside the various feature widgets (see Figure 8).

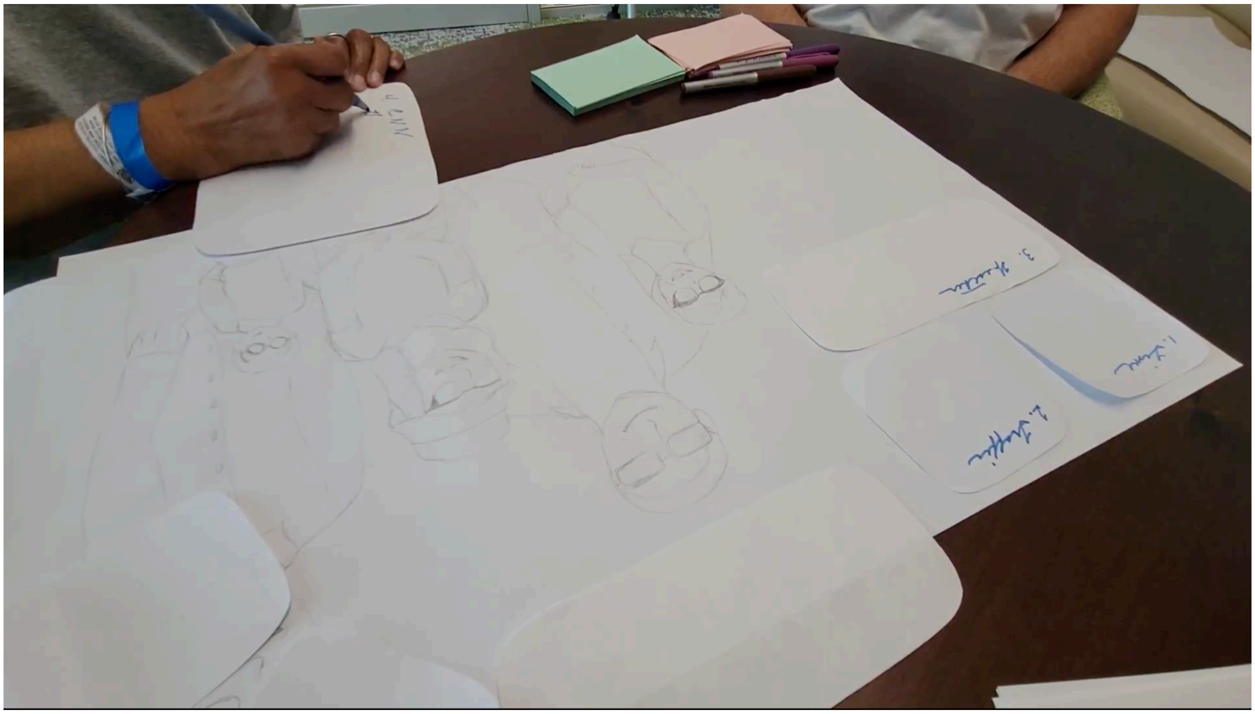


Figure 8: Image of co-design session where a participant is writing information on the kinds of widgets they would want included on the sleep screen

To conduct the co-design sessions, we also developed a general structure of how we imagined users to navigate the various elements of the interface, which we separated into “sleep” and “wake” screens. The sketched family photo represented what users would see when looking at the sleep screen, and the wake screen was represented by a blank sheet of paper that would display when users would navigate from the sleep to wake screens, in the same fashion that one might unlock a phone or computer. We then created co-design tasks to guide users through the various stages of interacting with the interface, starting with the sleep screen, then the wake screen, and finally the Activity Searcher feature, since that was the primary feature that we wanted to understand user’s preferences for (see Appendix F for the script we created to guide users through these three tasks). During the sessions, participants would either use provided markers to write on and place the smaller pieces of paper on the various feature widgets, or we would do so based on their verbal descriptions if that was easier for them. This process allowed them to think aloud as they considered how they would prefer this interface to be laid out, and show us how they would prefer elements to be arranged and what information would be present for each feature.

PROTOTYPE DESIGN

Low-Fidelity Prototype

From the co-design sessions, we came out with two versions of a paper prototype created mostly by our participants, with some guidance from us (see Figures 9 - 10). Some key aspects we learned from participants that we wanted to carry with us for our future iterations on the prototypes included the desire to include the person with MCI's name, some kind of calendar option and traffic information.

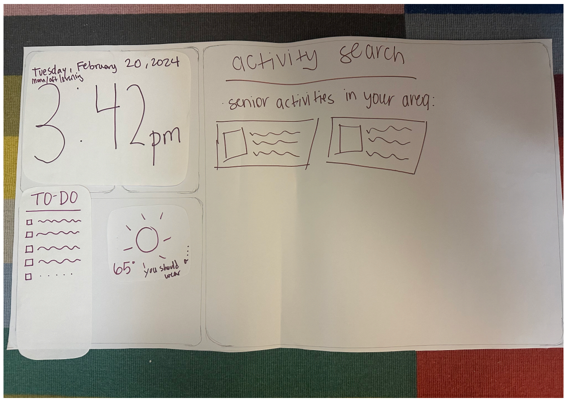


Figure 9

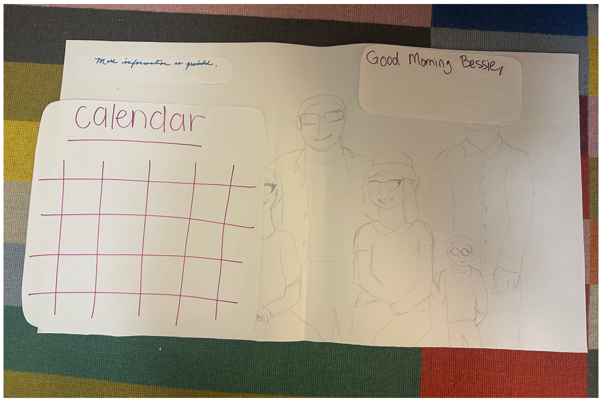
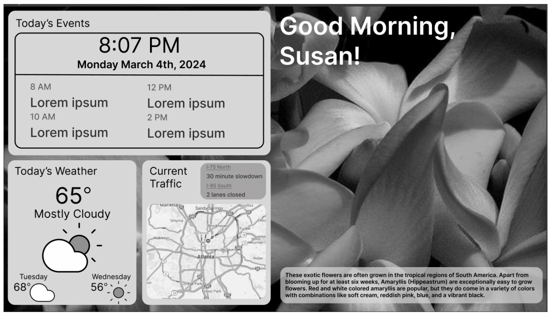


Figure 10

Mid-Fidelity Prototype

We then took the insights gained from the paper prototypes created in the co-design sessions and amalgamated the ideas into a digital design (see Figures 11 - 14 below). Based on the discussions, we found that there were a few key aspects that were important to include in our prototype such as having the date and time largely displayed, including photos with a description of what is being shown, having tips included in the weather feature to help the person with MCI such as traffic or outfit considerations, and including activity suggestions from both the user's messages and online through websites like Groupon.



8:07 PM
Monday March 4th, 2024

8 AM Lorem ipsum
10 AM Lorem ipsum
12 PM Lorem ipsum
2 PM Lorem ipsum

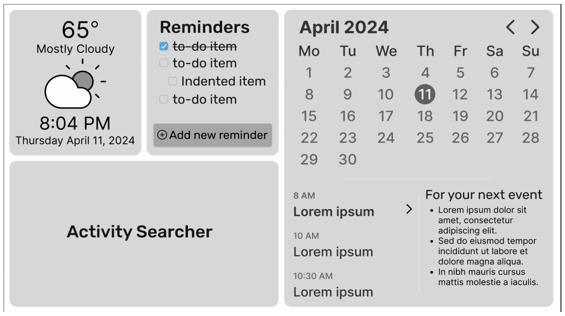
65°
Mostly Cloudy
Tuesday 68°
Wednesday 56°

I-75 North
30 minute slowdown
I-85 South
2 lanes closed

Good Morning, Susan!

These exotic flowers are often grown in the tropical regions of South America. Apart from blooming up for at least six weeks, Amaryllis (Hippeastrum) are exceptionally easy to grow flowers. Red and white colored amaryllis are popular, but they do come in a variety of colors with combinations like soft cream, reddish pink, blue, and a vibrant black.

Figure 11: Sleep screen



65°
Mostly Cloudy
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Thursday April 11, 2024

☑ ~~to-do item~~
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April 2024

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Figure 12: Expanded calendar view

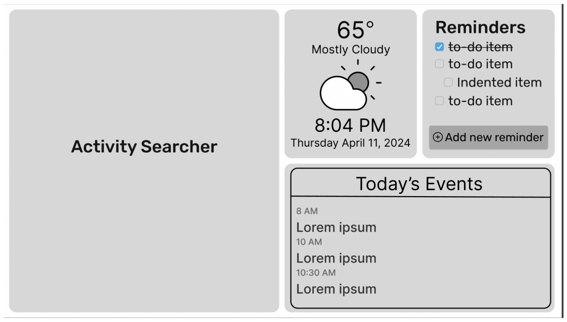

Figure 13: Expanded Activity Searcher view

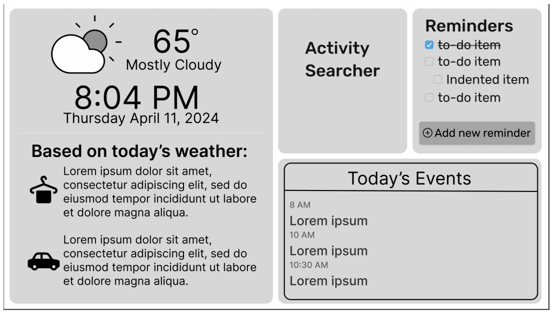

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Figure 14: Expanded weather view

High-Fidelity Prototype

From there, we moved on to our first iteration of a high-fidelity version of our prototype. To begin this process, we first made design decisions on our theme colors, font style, and widget layout. We decided on using two primary colors, as to not overwhelm the user with too much color and give more focus to the information on the screen. Blue was chosen as one of the primary colors because it was found that this is a more preferred color for aging eyes (ElderTech, 2017) and evokes feelings of calmness (UXPin, 2023). Yellow was the other primary color chosen because it evokes feelings of warmth and optimism (UXPin, 2023). We also utilized the website coolors.com to help choose the exact shade of blue and yellow, as the site allowed us to see how the various shades of our chosen colors would look when used together and had a tool to make sure the colors were distinct enough for use by those with every kind of color blindness. The Montserrat font was chosen because, according to an article by Nielsen Norman, it is easier for aging eyes to read (Norman, 2022). Finally, we chose to use a docked card view of our features to keep an "ever present" layout of information so that the person with MCI could always see every feature that is available to them.

With these design decisions in mind, we moved on to creating our high-fidelity prototype. This included a sleep screen with photos of the person with MCI and their loved ones and a short description of relevant information on the image, as well as a quick view of three main features available to them (see Figure 15). After "waking" the device, the user could navigate to four different types of expanded views (see Figure 15) to get more information on their calendar events, their to-do list, and the weather, or to search for and join new activities with the Activity Searcher feature. We utilized color to highlight which expanded view the user was in, with the widget that users would be currently interacting with colored yellow and blue being used for the other widgets so that users knew which features and information was available to them to expand, if needed. Additionally, within the Activity Searcher, when a user accepts or declines an event, there is a pop up that confirms the action they have taken. Care partners can also set up reminder notifications to pop up at certain times to encourage the person with MCI to do a certain task or action.

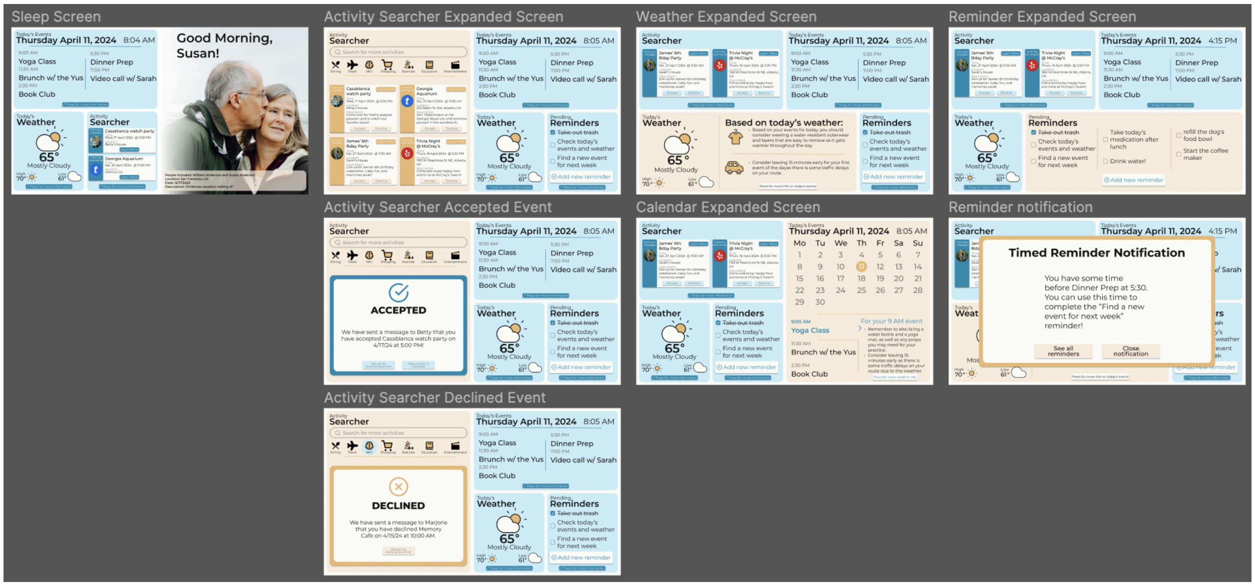


Figure 15: High-Fi prototype of sleep and expanded screens

EVALUATION PROCESS & RESULTS

Heuristic Evaluations

Once we had completed the first iteration of our high-fidelity prototype on Figma, we conducted a total of four heuristic evaluation sessions to assess its effectiveness across a variety of functional domains. We wanted to understand how our interface functioned from both a broader UX perspective, as well as how it might function for our target users. We intentionally chose heuristic evaluations instead of usability testing at this stage because we knew that putting our prototype in front of users before it took a more final, in-situ form would be difficult for people diagnosed with MCI to engage with. Conducting heuristic evaluations allowed us to get the feedback we needed to iterate on our high-fidelity prototype so that future usability testing could have the backing of expert feedback. Our experts were chosen based on unique and targeted areas of expertise that best approximated the feedback we might get more indirectly from users. Our evaluators included:

Two Subject Matter Experts

1. A **Neuropsychologist**, who specializes in MCI
2. A **Gerontologist**, who has over four decades of experience in the field

Two User Experience Experts

1. A **Senior Digital Product Manager**, who has many years of industry experience in developing successful user interfaces for a wide variety of customers

2. A **UX Research Scientist**, who has worked on HCI projects involving people diagnosed with MCI and their care partners in the past

Our method for these evaluation sessions consisted of a single, one-hour virtual think aloud session with each evaluator in which they were asked to navigate through three tasks. These tasks included navigating event acceptance and declinations, navigating between the various features on the interface, and navigating the unexpected occurrence of a reminder pop up message (see Appendix G for heuristic evaluation script details). The feedback we received from each of the four experts was categorized based on which of the 10 Usability Heuristics for User Interface Design created by Nielsen Norman Group each piece of feedback addressed. Below is a breakdown of how we then modified our prototype into its second iteration based on these heuristic categorizations.

Heuristic Results & Design Changes

From the feedback we received, we found the need to iterate on our design specifically around five of the 10 usability heuristics. An overview of all the updates and how the new interactions between features play out can be seen in our product demonstration video (see Appendix H).

Recognition Rather than Recall

We learned from the neuropsychologist that color is a great tool to visually differentiate features and allow for ease of use within our target user group by creating a mental model that a specific color is associated with a specific feature. Based on this insight, we updated our theme colors from two primary colors to five. Instead of using yellow to highlight the widget that the user should be focusing on, we shifted to giving each of our five features a theme color that users could more easily recognize. Once again, coolors.com was used to check for color blindness and confirm that the five colors were always easily differentiable.

We also received feedback to employ color to separate between the two categories of event types. Instead of having a single dark yellow event color for both events coming from the user's messages and from the community, we employed two different shades of yellow so users could easily distinguish where a particular event card came from (see Figure 16).

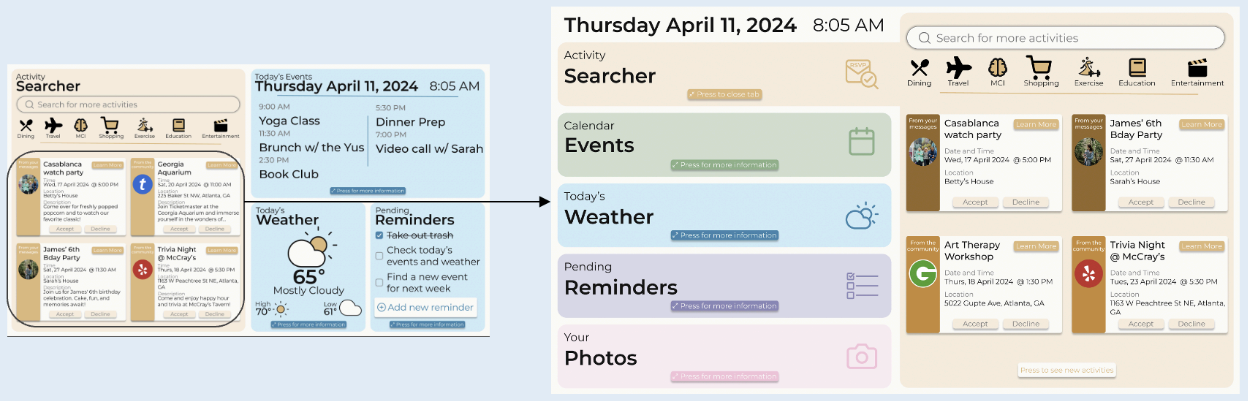


Figure 16

Consistency and standards

We also received feedback that shifting from one expanded view to another was disorienting as the features expanded and collapsed in different areas of the screen. To remedy this, we revised our layout from a docked card view to a tab view (see Figure 17). In the updated tab view, users are able to see all the features available to them on the left side of the screen and can get more information as they click through the tabs.

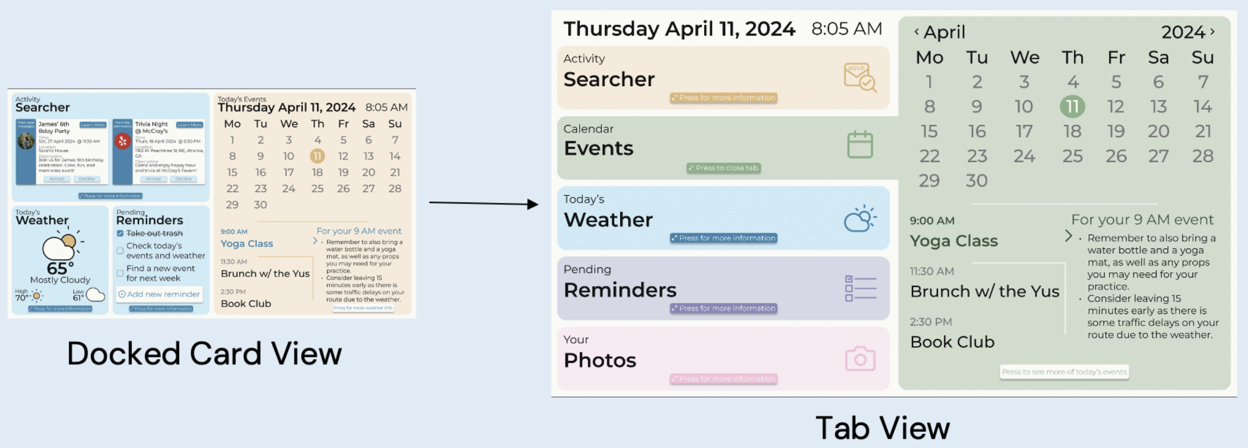
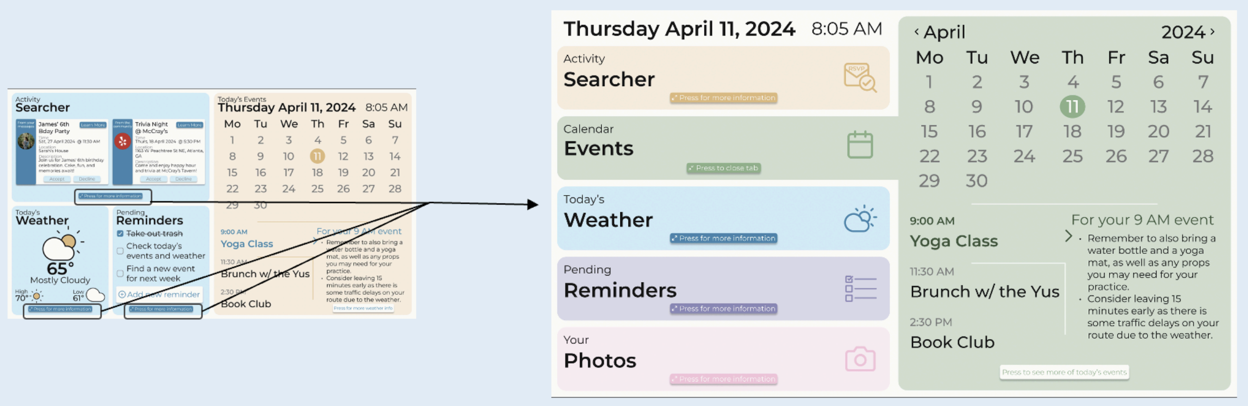


Figure 17

User control and freedom

In our original design, the minimized blue widgets had a button option for users to “press for more information.” However, there was no indication for them to minimize the information on the expanded yellow widget so that the element could be collapsed on tap as well. In our updated tab view design, users have the option to “press for more information” on the unselected tabs, as well as the option to “press to close tab” for the selected tab (see Figure 18).

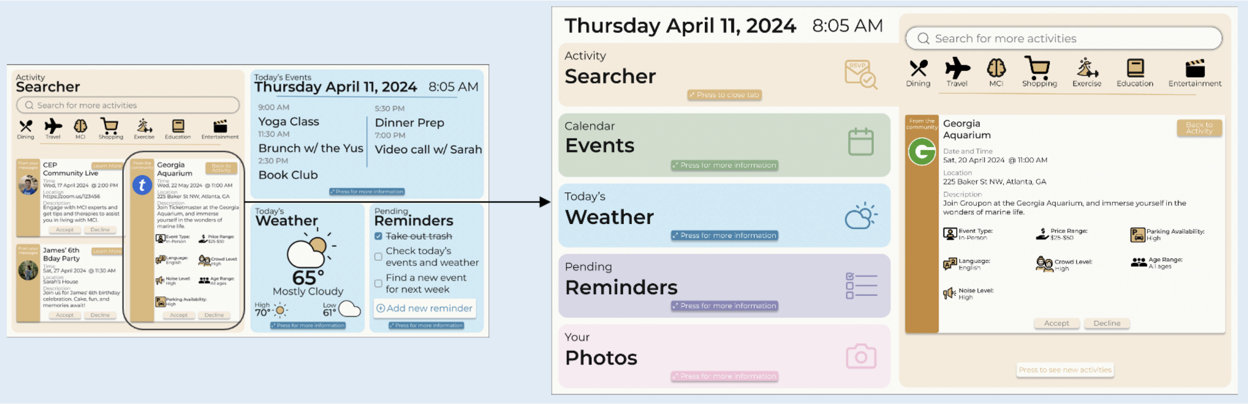


- Remember to also bring a water bottle and a yoga mat, as well as any props you may need for your practice.
- Consider leaving 15 minutes early as there is some traffic delays on your route due to the weather.

Figure 18

Aesthetic and minimalist design

Regarding our event cards in the Activity Searcher, we also received feedback to increase the white space between the headers and subheaders. Additionally, our experts told us that we do not need as much information on the preview of the event cards, as we have an option for users to click for more information about the card as well. To address this, we added more white space between the titles and reduced the amount of information on the event card previews (see Figure 19).



Join Groupon at the Georgia Aquarium, and immerse yourself in the wonders of marine life.

Figure 19

Based on our first iteration of our high-fidelity prototype, we were told that having information from all the available features was overwhelming and could cause users with MCI to get distracted from their current task and forget why they came to use the device. To avoid this confusion and information overload, in addition to updating the layout, we increased the white space overall and reduced the amount of information shown to only what was most relevant for the user's given task.

Flexibility and efficiency of use

Originally within the Activity Searcher, if a user found an event from the community that they were interested in and clicked accept, we imagined that the device would send the user a link to the website for them to RSVP. However, we received feedback that this could be confusing for users with MCI as the pop up that was shown after clicking accept did not immediately indicate that more steps needed to be taken. Additionally, this interaction had a lot of clicks to take that could be reduced. To remedy this, we came up with two solutions that the care partner could choose between during the onboarding of our device, based off of personal preferences and dyad dynamics regarding scheduling activities. The first option allows people with MCI to indicate that they are interested in the event, which would trigger information to be sent to the care partner for further input to then accept/RSVP on the third-party event website. The second option integrates the webpage within the event card, allowing users to access the webpage and accept the event from SocialConnect itself.

Lastly, we got feedback that integrating audio cues throughout the interactions would benefit the users and help them engage more with the device. While we did not have time to explore this, we want to note that we imagine this could be integrated into the Activity Searcher to audibly cue users when an event has been accepted or declined, as well as alert users when a timed reminder notification pops up on the screen.

Discussion & Conclusion

Significance, Contributions, and Limitations of This Work

We pursued this topic space because we identified an opportunity gap in the available means of technological support for encouraging and managing socialization activities for people diagnosed with MCI and their care partners. We believe that the solution we have created achieves this goal and therefore fills that gap, which we say confidently due to the deeply involved role that our two primary user groups had in the process of discovering our final solution. Every aspect of this design was informed directly by either users' needs and preferences, peer-reviewed research within this field, or by the opinions of various subject matter experts in the areas of user-centered qualitative research, physical and cognitive aging, MCI, neurology, accessibility, and UX heuristics. As we will touch on further in the Future Work section below, we also believe that this work is significant in the opportunity it presents for further advancement and expansion to support not only socialization for people with MCI and their care partners, but all aspects of the daily lived experiences of these user groups, as well as other user groups who may have a need for a similar at-home solution.

While successful in its instantiation of our research findings, the applicability of our work to a larger audience of people with MCI is limited because our participant pool only included current and past participants in the Emory CEP. Since this program requires people diagnosed with MCI to go through the program with a care partner, the scope of our data only includes structured dyadic care teams that have access to private healthcare and an increased understanding of academic research participation due to the nature of the CEP as a research-focused environment. Our work is also limited to dyads that are either co-located or those where the care partner has continued physical access to the interface, because the majority of our participants cohabitate with the other member of their dyad.

Reflections

We found that, while calibrating user involvement in research is hard across the board for most projects, we faced a unique set of challenges for our user group. Since we are working with people with cognitive decline, we wanted to prioritize their involvement and viewpoints throughout our project throughout all our different research methodologies and design process. This involved being extremely thoughtful about how we structured our sessions with the participants, both the people with MCI and their care partners, to ensure that they were comfortable and felt as though their voices were being heard and correctly represented in the creation of our design artifacts.

Our other major reflection point involved being flexible and adaptable to a tight timeline. As we are both researchers at heart and wanted to prioritize backing our decisions behind thorough validation, we found that we had the potential to fall down many rabbit holes to address very specific issues that our user group brought up. In these times, we learned how to take a step back and start looking at the whole picture to tend to the project’s needs in its entirety and decide on our next steps based on this outlook.

Future Work

Looking to the future, we would like to conduct usability testing with both care partners and people with MCI. This would involve carrying out A/B testing to find which of the two wake screen layouts, the tab view or the docked card view, would be preferred for this user group. To fit the needs of our user group, we imagine that these usability tests would involve mimicking the real-life features of our prototype, such as motion activation and audio cues, as well as personalizing the information presented on the screens. We believe this would be the most beneficial for participants because they would get to experience the SocialConnect device as it would be if it were actually integrated into their home and lives rather than having to imagine how it would fit into their routines.

We would also like to explore expanding the SocialConnect ecosystem. This expansion would be twofold. The first area of focus would be to test the interface on different modalities, such as tablets and mobile phones, to see which is most preferred with our target users across different tech proficiencies and income levels. The second focus area involves exploring the possibility and potential preference for a care partner companion app. This would allow care partners to input information or set up preferences on the companion app to send to the main SocialConnect device that the person with MCI would be interacting with.

Conclusion

As the incidence of MCI goes up and ability to diagnose it early on improves, there is an ever-growing need to create solutions that address the needs of this unique user group that both needs support, and has the capacity to benefit greatly from compensatory technology. Recognizing the important part that informal care partners also play in the journey through receiving and managing an MCI diagnosis creates an even greater need to create support technology for these users, because a single solution has the potential to support multiple target user groups who are experiencing the same situation from different perspectives. It is always essential to research for and design new technologies with user needs and preferences at the center, but this is especially true when it comes to users who may be at a disadvantage when it comes to navigating technology and being able to adapt to new products. SocialConnect has the ability to not only support the user groups we worked with, but to grow and change into something that can be useful for larger demographics of people diagnosed with MCI, and potentially beyond this diagnosis into other at-home use cases. We believe in the power of creating for those who operate at the margins of technological advancement, and we are excited for the future of this field of research.

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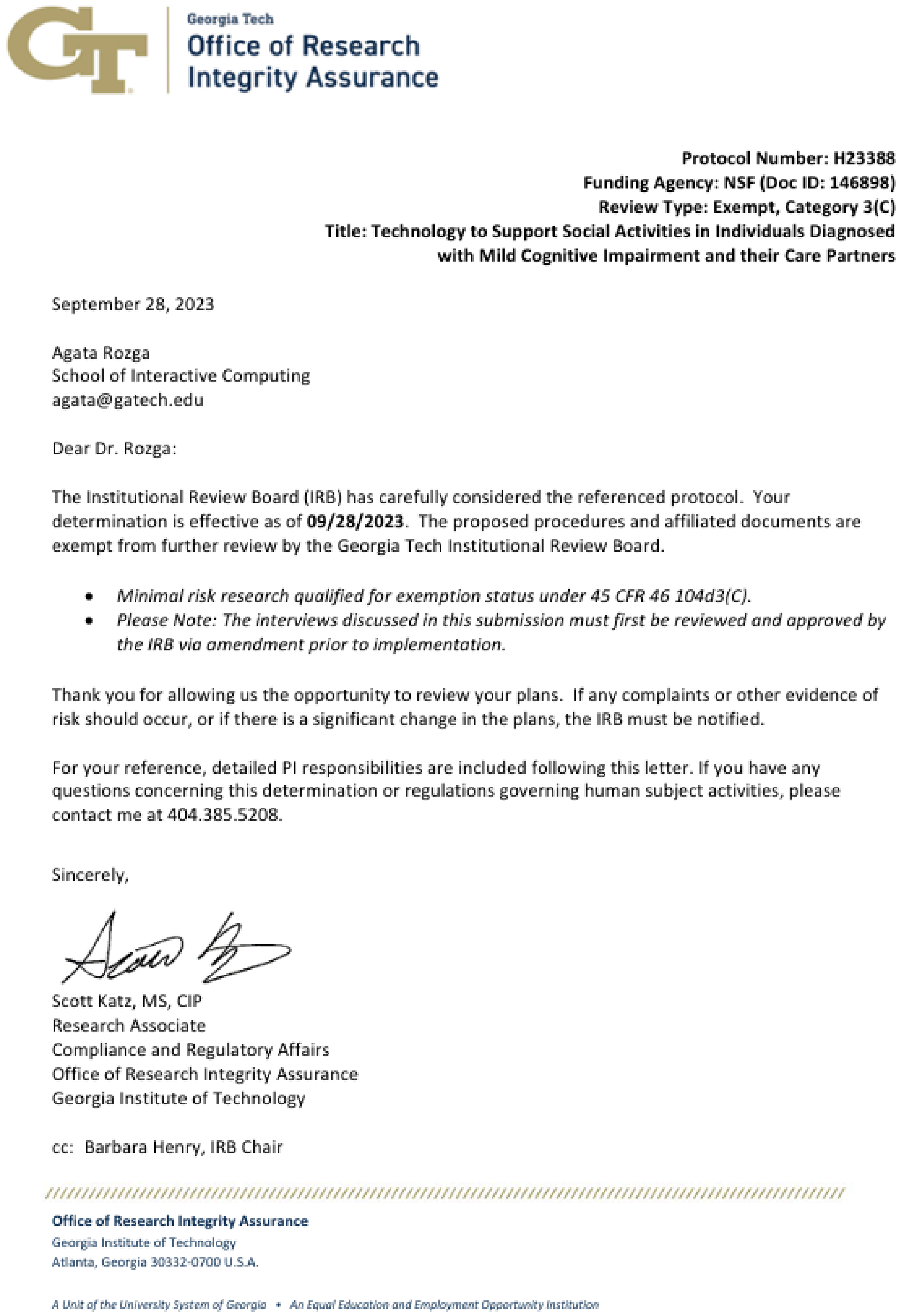
APPENDICES

Appendix A: IRB Exempt Approval



Georgia Tech
Office of Research
Integrity Assurance

Protocol Number: H23388
Funding Agency: NSF (Doc ID: 146898)
Review Type: Exempt, Category 3(C)
Title: Technology to Support Social Activities in Individuals Diagnosed with Mild Cognitive Impairment and their Care Partners

September 28, 2023

Agata Rozga
School of Interactive Computing
agata@gatech.edu

Dear Dr. Rozga:

The Institutional Review Board (IRB) has carefully considered the referenced protocol. Your determination is effective as of **09/28/2023**. The proposed procedures and affiliated documents are exempt from further review by the Georgia Tech Institutional Review Board.

- *Minimal risk research qualified for exemption status under 45 CFR 46 104d3(C).*
- *Please Note: The interviews discussed in this submission must first be reviewed and approved by the IRB via amendment prior to implementation.*

Thank you for allowing us the opportunity to review your plans. If any complaints or other evidence of risk should occur, or if there is a significant change in the plans, the IRB must be notified.

For your reference, detailed PI responsibilities are included following this letter. If you have any questions concerning this determination or regulations governing human subject activities, please contact me at 404.385.5208.

Sincerely,

Scott Katz, MS, CIP
Research Associate
Compliance and Regulatory Affairs
Office of Research Integrity Assurance
Georgia Institute of Technology

cc: Barbara Henry, IRB Chair

Office of Research Integrity Assurance
Georgia Institute of Technology
Atlanta, Georgia 30332-0700 U.S.A.

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Appendix B: Exempt Consent Form

You are being asked to be a volunteer in a research study. The purpose of this study is to identify opportunities for technology to support the social activities of individuals diagnosed with Mild Cognitive Impairment (MCI) and their extended care networks.

As part of the study, you will take part in either a feedback session or a semi-structured interview where you will be asked open-ended questions about your experiences and preferences regarding technology-based scheduling and socialization. This may include showing you visuals or paper examples of potential technologies and asking your input and feedback on specific features and capabilities that these systems could have.

The interviews and feedback sessions may be conducted in-person at Georgia Tech or at the Emory Cognitive Empowerment Center, online through the Georgia Tech managed Zoom video conferencing system, or over the phone. In person and phone interviews will be audio recorded and Zoom interviews will be video recorded. Any sessions that involve giving feedback on technology prototypes will be video recorded. We will always ask you first before starting any recording. A single interview or feedback session will take up to one hour to complete. We will ask your permission to contact you to see if you are interested in participating in any follow up sessions. You may withdraw from the study at any time.

You cannot be located outside of the United States to participate in this study. You must be at least 18 years of age to participate in this study.

To protect your confidentiality, you will be assigned a unique study ID. Any data we collect from you will be saved with this ID, and any files linking this ID to your name or contact information will be kept separate and password protected. All digital data will be stored on secure Georgia Tech cloud storage services (e.g. Box) or university-maintained servers, and will only be accessed by the study team members. We may also share the data we collect from you with collaborating researchers. When we share the data, we will save it with your ID and will not include your name or other identifying information about you.

The risks involved are no greater than those involved in daily activities. You will not benefit from or be compensated for joining this study. We will comply with any applicable laws and regulations regarding confidentiality. To make sure that this research is being carried out in the proper way, the Georgia Institute of Technology IRB may review study records. The Office of Human Research Protections may also look at study records. If you have any questions about the study, you may contact Agata Rozga (PI) at email agata@gatech.edu, Josey Benandi at email jbenandi@gatech.edu, or Dipti Gupte at email dgupte3@gatech.edu. If you have any questions about your rights as a research subject, you may contact the Georgia Institute of Technology Institutional Review Board at irb@gatech.edu. Thank you for participating in this study.

By verbally indicating your consent (if in person) or completing this online (via Qualtrics Survey), you indicate your consent to be in the study.

Appendix C: Focus Group Script

Subject Matter Expert Focus Group/Design Session Guide
Older adults with MCI and their care partners

INTRODUCTION

Thank you so much for participating in this study. We are Georgia Tech master's students in the Human-Computer Interaction program, and we are supported by the Georgia Tech AI-CARING Institute, which is funded by the National Science Foundation.

For this study, we are working with individuals diagnosed with Mild Cognitive Impairment and their care partners. We have asked for your participation today because we want to hear from you about three things. First, we would like to learn about how you enjoy spending time with others in social or recreational activities. Then, we would like to learn whether there are activities that you would like to engage in that have become more challenging over time. Lastly, we want to hear what ideas you have for supports that may increase your opportunities for socializing. We would like to use the insights that you share with us today to explore technology-based supports.

We expect this session to take approximately an hour. We will be recording our conversation so we can refer to it later. This recording will not be shared with any public audience. The only people who will view or hear the recording will be members of our research team. Your name(s) and any identifying information you mention, such as where you live, where you work, or whom you work with, will be kept confidential. Quotes from your interview may be used in a publication or presentation of our research, but again, it will not include your name or any identifying information about you.

We placed a consent form in front of you to read over before the focus session begins. Your participation is voluntary, and you can leave the session at any time.

Do you have any questions before we get started?

We are now turning on the recording. If there are any questions you do not feel comfortable answering, please feel free to say “pass”.

Today, we will be asking you to reflect on three topics. For each reflection topic, we will first ask you first to write down your answers and ideas on sticky notes . Then, we will open it up to a group discussion to give you an opportunity to share what you have written down. I will be taking notes, and I will also collect your sticky notes at the end of the session.

First Topic: **I like…**

(Aspects that they like about current socialization habits/preferences for spending social time)

- 10 minutes of individual written reflection on sticky notes

- 10 minutes of discussion with facilitators taking notes

First, we would like you to think about and write down how you previously or currently enjoy spending time with and staying connected to others, whether that be with family, friends, acquaintances, or anyone else in you larger social network, how you spend time out in your community, and pursue hobbies, including those that may include others.

We will be allotting ten minutes for you to write down your ideas. As you complete a sticky note, my partner and I will take them and start organizing the notes into categories. Once the ten minutes are up, we will spend another 10 minutes discussing your ideas as a group.

Second Topic: **I wish…**
(Aspects about current socialization habits that they would want to change/improve)

- 10 minutes of individual written reflection on sticky notes
- 10 minutes of discussion with facilitators taking notes

Now, we will move on to the next section of our activity. For this section, we would like you to think about the categories we just discussed. Write down any challenges that come to mind with conducting these activities or any ideas on how they could be improved.

We will follow the same timing format as the previous section, with ten minutes spent writing down ideas and another ten for discussion. As before, my partner and I will take the completed sticky notes and start organizing the ideas into groups while you are writing.

Third Topic: **I wonder…**
(Aspects about new ways to facilitate socialization that they are interested in/like/dislike/etc.)

- 10 minutes of individual written reflection on sticky notes
- 10 minutes of discussion with facilitators taking notes

For our last section, we would like you to think and write down ideas for new ways to facilitate socialization in your life. If there were unlimited resources available to you, what kind of supports would you want to help increase your opportunities for socializing?

As before, you will have ten minutes to write down your ideas and then another ten minutes to discuss.

The following topic areas are means of socialization that we have found to be relevant through our review of literature pertaining to at-home socialization for older adults diagnosed with memory impairment. If participants do not initially mention these topic spaces during the "I like" and "I wish" portions of the focus group activity, we will probe for them during the "I wonder" portion.

- In our research on this topic, we found [topic area] to be a useful tool in socialization for adults diagnosed with MCI. Would this be something you would be interested in? Why or why not?

- Digital art therapy
- Reminiscence multimedia
    - Photos
    - Videos
    - Music
- Shared diaries
    - Personal memories
    - Imagery
    - Experiences
- Use of video calling
    - With current network and/or with new people
- Shared reading groups
    - Books
    - Poems
- Connection through online games
    - Gamification of socialization

Appendix D: Interview Script (Rounds 1 and 2)

Subject Matter Expert Interview Guide
Older adults with MCI and their care partners

INTRODUCTION

Thank you so much for participating in this study. We are Georgia Tech master's students in the Human-Computer Interaction program supported by the Georgia Tech AI-CARING Institute, funded by the National Science Foundation.

For this study, we have conducted focus group sessions and preliminary Zoom interviews with individuals diagnosed with Mild Cognitive Impairment and their care partners. We asked them how they enjoy spending time with others in social or recreational activities, whether there are activities they would like to engage in that have become more challenging over time, and ideas they had for supports that may increase opportunities for socializing. These focus group sessions provided us information about needs surrounding social activities, and we have used that information to create today's interview. Ultimately, we hope to use the insights that you share with us to explore technology-based supports by conducting hands-on-activities later on that will help to visualize ways in which we might address opportunities for improving your socialization.

We would like today's interview to explore in more depth some of the ideas that came out of our focus groups, including socializing with those who share common experiences, as well as socializing around shared hobbies.

We expect this interview to take approximately 30-45 minutes. We would like to spend the first 20-30 minutes speaking with both of you together. We understand that you may sometimes have different perspectives, and we want to make sure we hear from both of you. At the end, we would like to spend an additional 10-15 minutes speaking with just *{name of care partner}* to ask a few follow up questions.

We will be recording our conversation so we can refer to it later. This recording will not be shared with any public audience. The only people who will view or hear the recording will be members of our research team. Your name(s) and any identifying information, such as where you live, the activities you engage in, or whom you engage in them with, will be kept confidential. Quotes from your interview may be used in a publication or presentation of our research, but again, it will not include your name or any identifying information about you.

(Previously), we gave you each [will give you each] a consent form to read over before today's interview. Your participation is voluntary, and you can stop the interview at any time.

Do you have any questions at this point?

INTERVIEW

I am now turning on the recording. If there are any questions you do not feel comfortable answering, please feel free to say "pass."

We are interested in understanding your experiences and practices as they relate to socialization. When we say "socialization," what we mean is the ways in which you plan for and engage in social activities of any kind, including both in-person and virtual activities with family, friends, new connections, and people in your larger network. These activities may include pre-existing events such as classes and arts engagement, or activities that are initiated by you or those you know.

Do you have any questions before we get started?

First I would just like to understand the nature of your relationship and living arrangement.

What is your relationship? *{probe for partner, spouse, adult child, etc.}*

Do you currently live together?

[if yes] Are either of you currently working outside the home? *[if yes for either]* How many hours per week? How much time do you typically spend together across the week? Do you speak on the phone or via video call? How often?

[if no] Do you see each other in person? *[if yes]* How many days per week do you see each other? How much time do you typically spend together across the week? Do you speak on the phone or via video call? How often?

About how much time per week on average do you think you spend planning for and engaging in social activities?

Now I would like to chat with you about the ways in which you engage in social activities:

1. **Common Experiences:**

In our focus groups, we found that people said they want a greater variety of activities targeted toward groups that they share things in common with, such as a diagnosis of MCI, a particular age group, or other life experiences and situations that are shared. Does this resonate with you?

[if yes] What kind of groups are you looking for?

2. **Shared Hobbies:**

In our focus groups, we found that people said they engage in and enjoy shared group activities and hobbies. Do any of your social activities include engagement with an organized group, such as a book club or discussion group?

For each activity listed above:

[*If they currently* ***do*** *the activity*]

a. How

How do you plan for these activities? Do you face any challenges in finding and planning for these activities?

Do you find that this activity accommodates your preferences? Why or why not?

Are these activities virtual?

[if yes] Is this your preference? Do you face any challenges in engaging in this activity virtually?

[if no] How are you getting to and from these activities? Do you face any challenges in navigating to and from these activities?

b. Who

Who do you engage in these activities with?

Is there anyone you would like to engage with more? {prompt for pain points or supports for how they currently connect with network}

c. Memory

Has a diagnosis of MCI affected your ability to engage in this activity?

[if yes] How?

[*If they **don't** do the activity but **want** to*]

a. How

What do you think is preventing you from engaging in this activity? What would need to change in order for you to be able to engage in this activity? *{prompt for preferences surrounding virtual vs. physical activities}*

Do you face any challenges finding activities that accommodate your preferences?

b. Who

Who would you like to engage in this activity with? Does the involvement of those in your network influence your interest in engaging in this activity? *{prompt for pain points or supports for how they currently connect with network}*

c. Memory

Has a diagnosis of MCI affected your ability to engage in this activity?

[if yes] How?

[*If they **don't** do the activity and **don't** want to*]

a. How

What do you think are some reasons you choose not to engage in this activity?

Would you engage in activities that better accommodated your preferences?

Are there any additions or improvements to this activity that would make you consider trying it in the future? *{prompt for preferences surrounding virtual vs. physical activities}*

b. Who

Would the involvement of those in your network change your interest in engaging in this activity?

[*if yes*] Who would you like to engage in this activity with? *{prompt for pain points or supports for how they currently connect with network}*

c. Memory

Has a diagnosis of MCI affected your decision to not engage in this activity?

[if yes] How?

Other possible socialization:

Are there any social activities we have not discussed that you would like to mention?

Imagined futures:

Possible prototype

Based on the results from our focus group sessions, we found that there is a need for some kind of technology situated in the home to help support users in finding and engaging in social activities. We also found that there is a need for technology that displays information in a larger format than a cell phone or computer, and so we imagine that such a display could be present within a mirror or picture frame. These objects, when activated, could display information such as opportunities for new social engagement and reminders about upcoming events, and they could also provide context users may need about their social engagements such as where they are going, who they are meeting with, and information about those individuals.

Ultimately, a goal we have identified from these findings is to assist in the discovery of and engagement in new activities, and in our past interviews, we have found that filtering for accommodations such as noise level would be helpful. Would you like to use filters to set preferences for the kinds of social activities you can discover? *[if yes] What kinds of filters would you like to see? [if no] Why not?*

We imagine that these objects could be embedded into a table, mounted on a wall, or placed on a commonly used surface. Where in the home would you like to interact with something like this? Why?

What size screen would you prefer to use? [if need more prompting: size of tablet, tv, somewhere in between, smaller, larger]

Last 10-15 minutes, just with care partner (if dyad is cohabitating):

We would like to give you an opportunity to expand on any of the topics that we already discussed today. Is there anything additional that you would like to share about what’s working or not working in terms of you and *{name of pwMCI}* engaging in social activities?

In the past, would you and your partner prefer to participate in social activities together, separately or a mix of both?

Has those preferences changed now and if so, how?

{probe for if people want to do things together and if CPs want to navigate social coordination}

Has a diagnosis of MCI changed in the ways in which you engage in social activities?

Appendix E: Demographic Survey

AI CARING

Demographic Questionnaire

Please answer the following questions. All your answers will be treated confidentially. If there is a question you do not wish to answer, please just leave it blank and go on to the next question. Thank you in advance for your help.

1. First Name:

2. Last Name:

3. Email Address: *(e.g. SusanBrown@Gmail.com)*

Consent Form

You are being asked to be a volunteer in a research study. The purpose of this study is to identify opportunities for technology to support the social activities of individuals diagnosed with Mild Cognitive Impairment (MCI) and their extended care networks. As part of the study, you will take part in either a feedback session or a semi-structured interview where you will be asked open-ended questions about your experiences and preferences regarding technology-based scheduling and socialization. This may include

By verbally indicating your consent or by completing this form online, you indicate your consent to be in the study.

○ I Consent

Please select one of the following:

○ I have a diagnosis of MCI

○ I am a care partner of a person diagnosed with MCI

Please enter your age.

(Leave blank if you prefer not to answer)

With which gender do you identify?

○ Male

○ Female

○ Prefer not to answer

Do you consider yourself to be Hispanic or Latino?

○ Yes

○ No

○ Prefer not to answer

How would you describe your primary racial group?

○ No primary group

○ White/Caucasian

○ Black/African American

○ Asian

○ American Indian/Alaska Native

○ Native Hawaiian/Pacific Islander

○ Multi-racial

○ Other (please specify)

○ Prefer not to answer

What is your highest level of education?

○ No formal education
○ Some education in school
○ High school graduate/GED
○ Vocational training
○ Some college/Associate's degree
○ Bachelor's degree (BA, BS)
○ Master's degree (or other post-graduate training)
○ Doctoral degree (PhD, MD, EdD, DDS, JD, etc.)
○ Prefer not to answer

What is your current marital status? (please choose one)

○ Single
○ Married
○ Separated
○ Divorced
○ Cohabitating
○ Widowed
○ Prefer not to answer

How many children do you have?

○ 0
○ 1
○ 2
○ 3
○ 4+
○ Prefer not to answer

How many grandchildren do you have?

○ 0

○ 1

○ 2

○ 3

○ 4

○ 5+

○ Prefer not to answer

What is your current living arrangement?

○ Private house/apartment/condominium

○ Senior housing (independent)

○ Assisted living

○ Nursing home

○ Relative's home

○ Other (please specify)

○ Prefer not to answer

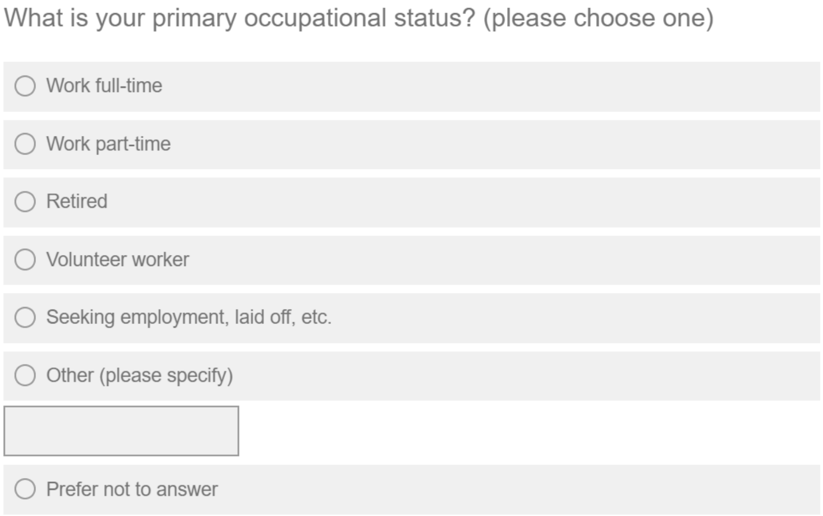
Do you live alone?

○ No

○ Yes

○ Prefer not to answer

How many other people are in your home?



What is your primary occupational status? (please choose one)

○ Work full-time

○ Work part-time

○ Retired

○ Volunteer worker

○ Seeking employment, laid off, etc.

○ Other (please specify)

○ Prefer not to answer

We thank you for your time spent taking this survey.
Your response has been recorded.

Appendix F: Co-Design Script

Part 1: Sleep Screen

The sleep screen of this device will largely encompass one photo or a rotation of photos of you and your loved ones. It will be displayed **before** the screen is ***"woken up,"*** while you are not engaged with it.

<u>Activating the screen</u>
How would you like to engage this screen to change it to the ***wake screen***?

a. **Motion** - walking up to or past it

b. **Voice** - saying specific words
c. **Touch** - touching somewhere on the screen
d. A **combination** of the above

Included information

Would you like any information included on the sleep screen?

e. If yes, what kind of information would you like to have included?
   Options:
   - Greeting (“good morning” etc.)
   - Date/day of the week
   - Calender events
   - Weather
   - Reminders

Picture details

Would you like to have names of your friends and family displayed on this screen?

If so, how might you imagine this to look?

Part 2: Wake Screen

Similar to the example photos provided, this screen would provide a variety of features that are intended to aid in your social activity.

<u>We would like to know the following:</u>

1. What features would you want to have on this screen?

2. How much space would you like each feature to take up and where on the screen would you like that feature to be placed?

   <u>List of potential features</u>:
   - **Weather**
     - *<u>For example</u>: Using the weather feature to make a decision about what to wear when leaving the house for an activity*
   - **Calendar**
     - *<u>For example</u>: Using the calendar feature to remember the day's activities, their time, their location…*
   - **Activity Searcher**
     - *<u>For example</u>: Searching for and saving activities of your choosing to engage in now or later*
   - **Reminder/To-do list**
     - *<u>For example</u>: Looking at reminders to help plan for upcoming activities*

Please feel free to rearrange the provided pieces of paper to represent your preferred arrangement of features.

Part 3: Activity Searcher

This feature will be used to look up new activities. You will be able to refine your search to find activities that best fit your preferences.

<u>We would like to know the following:</u>

1. How would you like to interact with this feature to search for activities?
    a. *Example activities would include discussion groups, educational events, physical exercise, crafting*

2. Would you want to search for an MCI specific activity?
    If so, how would you want to do that?

3. Which of these categories would you prefer to use as a way to narrow down the list of suggested activities?

    <u>Potential categories</u>:
    - Parking availability
    - Age
    - Virtual or in-person
    - Price
    - Crowd level
    - Noise level
    - Language
    - Race/ethnicity

    Are we missing categories you would expect to see?

Wake Screen Examples

Appendix G: Heuristic Evaluation Script

Introductory Script:

My name is [me], and my partner [you] and I are master's students at Georgia Tech working on a project to support people diagnosed with MCI and their informal caregivers in engaging with opportunities for increased social engagement in the home. The system we have designed is intended to function as an everyday computing device, meaning that the product would be mounted to a wall in a user's home such that they are easily able and readily encouraged to interact with the device on a daily basis.

What we have for you to look at today is a limited prototype of the system we have designed that you can interact with on your device. We have a set of a few tasks that we will ask you to complete using this prototype and then we would like to hear your feedback on how you found the experience to be. This feedback will go toward making improvements to this system, but we do not expect that this prototype will develop into a full product.

During this process, we want you to describe what you are thinking when you are deciding what to click on, what you think things mean, what you expect to see, or how much you like or dislike parts of the design. Please be honest with your thoughts: there are no right or wrong answers.

And as you perform the tasks on this prototype, remember that we are testing the design, not testing your performance. You can stop at any time if you do not wish to continue.

Do you have any questions before we start?

Would you give consent to have this usability testing session video recorded?

Task 1: Navigating events

- 1a: RSVPing for an event aggregated from their phone based on a notification provided on the sleep screen (watch party)
  Throughout this session, we ask that you put yourself in the point of view of a person with MCI interacting with the device. You are currently viewing the lock screen and we imagine that this would be a photo frame that users would have hung up on a wall of their home. For the first scenario, your friend has invited you to watch a movie over text and you want to RSVP yes to her.
- 1b: Learning more info about community event and RSVPing yes (aquarium)
  For the next part, how would you find more information about the Georgia aquarium event and RSVP yes to it?
- 1c: Filter for mci-specific event in the community and decline memory cafe event
  For the last part of the activity search tasks, how would you look for MCI-specific events and decline the memory cafe event that you find?

Task 2: navigating from the calendar to the weather to learn about considerations for attending an event that day

For the next task, you want to get more information about your yoga class and how you should prepare to leave the house. How would you go about doing that from this current screen?

Task 3: maybe connecting the reminders feature to the others by requiring users to choose a feature that the reminder is about (for example, caregiver could maybe use reminder to prompt pwMCI to explore activities or look at their calendar for the day - maybe the reminders could have times associated with them, like alarms, where they pop up on top of everything else like a push notification to encourage engagement with the device)

For our final task of the day, we imagine that caregivers could program in scheduled reminders like the one that popped up on the screen right now. We would like to see how you, as a person with MCI, would interact with the device after receiving this notification.

Heuristic	**Your assessment: What is the problem? Where is it? Why is it a problem**
1. Visibility of system status Ÿ Always keep users informed about what is going on. Ÿ Provide appropriate feedback within reasonable time.	
2. Match between system and the real world Ÿ Speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Ÿ Follow real-world conventions, making information appear in a natural and logical order.	
3. User control and freedom Ÿ Users often choose system functions by mistake. Ÿ Provide a clearly marked "out" to leave an unwanted state without having to go through an extended dialogue. Ÿ Support undo and redo.	
4. Consistency and standards Ÿ Users should not have to wonder whether different words, situations, or actions mean the same thing. Ÿ Follow platform conventions.	

5. Error prevention Ÿ Even better than good error messages is a careful design which prevents a problem from occurring in the first place.	
6. Recognition rather than recall Ÿ Make objects, actions, and options visible. Ÿ User should not have to remember information from one part of the dialogue to another. Ÿ Instructions for use of the system should be visible or easily retrievable whenever appropriate.	
7. Flexibility and efficiency of use Ÿ Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user so that the system can cater to both inexperienced and experienced users. Ÿ Allow users to tailor frequent actions.	
8. Aesthetic and minimalist design Ÿ Dialogues should not contain information which is irrelevant or rarely needed. Ÿ Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.	
9. Help users recognize, diagnose, and recover from errors Ÿ Expressed in plain language (no codes) Ÿ Precisely indicate the problem Ÿ Constructively suggest a solution.	
10. Help and documentation Ÿ Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Ÿ Help information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.	

Appendix H: Demonstration of SocialConnect