

ABSTRACT

Title of Thesis: HEALTH, SELF-TRACKING TECHNOLOGIES, AND THE
EMOTIONAL IMPACTS THEY HAVE ON OLDER ADULTS
WITH MEMORY CONCERNS

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Most individuals, including older adults, in the United States are not meeting the recommended levels of physical activity for their age group. Research has shown that adopting self-tracking technologies can be one way to motivate users to increase their physical activity levels. Further, tracking progress in terms of health and wellbeing has the potential to support individuals with memory concerns; however, most older adults do not use technology to track progress towards their health-related goals. While traditional qualitative research might aim to uncover the reason behind this lack of adoption, this thesis instead focuses on how the topics of health and self-tracking technologies affect the lives of older adults with memory concerns. Leaning on a style of writing and analysis from anthropologist Kathleen Stewart, this thesis offers the reader a series of resonating stories— stories that have no obvious meaning, classification, or rationalization. Rather, these narratives gather the textures and intensities that participants face in their everyday lives and offer us a brief look into their habitus and interactions with the world

around them. By taking this approach, this thesis calls for more detail into participants' lived experiences that would otherwise be overlooked by traditional qualitative analysis.

HEALTH, SELF-TRACKING TECHNOLOGIES, AND THE EMOTIONAL IMPACTS THEY
HAVE ON OLDER ADULTS WITH MEMORY CONCERNS

by

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Chapter 1: Introduction

Physical activity is important for all age groups, and older adults are no exception. Physical inactivity is the 4th leading risk factor for mortality worldwide, and roughly 3.2 million deaths each year can be attributed to a sedentary lifestyle [1]. In industrialized societies where life expectancy has been increasing, physical activity levels have conversely been decreasing. In the United States, over 60% of adults over the age of 50 do not meet the recommended levels of physical activity [2]. In adults from England aged 65-74, only 20% of men and 17% of women achieve the activity levels recommended to them. These percentages drop to 9% and 6% respectively when looking at adults aged 75 and older [3].

One approach that has been taken to combat sedentary behaviors is through engaging in self-tracking behaviors. Studies have shown that intervention through self-tracking can encourage people to become more physically active and maintain those levels of physical activity [4]. Commercially available self-tracking technologies allow users to quantify and monitor a myriad of data about their health and physical activity. Common motivations for using such technology include increasing motivation, goal-setting, and self-discipline. [5]

Despite the fact that self-tracking technologies can promote a more physically active lifestyle, more than 50% of people who own self-tracking technologies do not use them anymore [6]. This high abandonment rate can be attributed to factors such as poor habit forming, not finding the data useful, or devices requiring too much work or maintenance. The last reason listed relates to a sentiment held by many older adults, which is that technology moves too quickly for them to comfortably keep up with [7]. This goes especially for older adults with memory concerns and

cognitive impairment, as they can be at a disadvantage when trying to learn and adopt new technologies and behaviors [8].

In this study, I interviewed 29 older adults with memory concerns to understand what their health-related goals are, the role self-tracking technologies can play in supporting these goals, and how goals and technology affect their everyday life. The writing style of this paper and approach to analysis takes influence from anthropologist Kathleen Stewart in order to portray the nuance of the emotions that surface when older adults with memory concerns discuss these topics. So much of people's emotions can be expressed through their cadences, tones, pauses, and the path that a conversation takes – all of which can be lost from the conventional qualitative analysis approach of straight transcription and coding. In traditional qualitative analysis, we analyze and compare statements that participants make about their perceptions of a topic or experience by grouping them by theme. In contrast, affective writing gives us a different kind of insight into participants' lives, allowing us to create an idiosyncratic view of potential connections between participants' emotions and experiences. Stewart defines affects as “a problem or question emergent in disparate scenes and incommensurate forms and registers”. She argues that such problems require both a speculative and concrete analysis; thoughts and emotions are not things that stem from specific lifestyles or habits, but rather, something that launches from the potential courses woven in scenes or encounters in people's lives.

By writing in this style, this thesis aims to capture the fleeting and ephemeral, yet charged and surging emotions that emerge from these conversations. When talking with participants, many salient themes and common concerns arose in the interviews, with many expressing similar

sentiments regarding their health-related goals and if they think self-tracking technologies can support those goals— findings supported by existing research in this field. However, this thesis takes a step back and expands on each of the scenes described by participants, offering the reader a more intimate narrative and empirical account of how older adults with memory concerns view self-tracking technologies. By touching on these narratives in greater detail, we see that seemingly comparable statements can stem from very different life experiences and concerns. Such insights can lead researchers to discover new ways of engaging with older adults with memory concerns, which in turn can lead to better designed technologies for this population.

Chapter 2: Related Work

This section provides an insight into how older adults with memory concerns use technology, best design practices for designing health and tracking technologies, and how self-tracking technologies impact users emotionally.

2.1 Older Adults with Memory Concerns and Their Technology Use

While older adults are increasingly becoming more familiar and adept with technology, most of these advancements are being made among seniors who are younger, more affluent, and more highly educated. Technology use remains quite low among older seniors, those from low socioeconomic status, and those who have attained lower levels of education [9].

There are many reasons why seniors do not adopt new technologies. Common barriers cited include a lack of instruction, the high cost of technological equipment, and a general lack of confidence, which relates to feelings of inadequacy, especially when compared to younger

generations [10]. Other factors that affect technology adoption are low-self efficacy and high anxiety regarding technology usage [11]. These barriers, particularly the lack of confidence, is noticeably increased among older adults who have concerns about their memory [12].

Older adults who self-identify as forgetful or who have cognitive impairment perceive more difficulties when using technological devices when compared to older adults who have no such impairments [12]. A major reason this is the case is because they feel that their memory concerns impede their use of technology, as technology usage relies on memory to remember how to use and navigate devices. This problem is exacerbated when factoring in the pace at which technology advances [12]. As technological advancements are made, users are forced to re-learn how to interface with and use technologies they already have once learned [12]. This process of re-learning and the knowledge of having to relearn technologies in the future in conjunction with self-perceived low technological proficiency can lead to a frustrating user experience for older adults with memory concerns when using technology.

This divide between technology usage in older adults who have cognitive impairment and those who do not goes beyond self-perceived technological proficiency. Studies have indicated that when asked to complete a task using technology, cognitively typical older adults outperform their peers who have cognitive impairments with regards to both time taken to complete the task and the number of errors made [13].

The above factors certainly contribute to a frustrating user experience for older adults with memory concerns when using technology. However, studies have shown that technology use is

helpful for older adults with memory concerns or cognitive impairment, as it can help them achieve goals they set for themselves [12], support their memory, and help them to live independently [14].

Lorenz et al. categorized technology use for people with dementia into 6 categories: “memory and support of self-care and activities of daily living”; “treatments and intervention delivery”; “safety, security, monitoring and reassurance”; “training”; “care delivery, management and support”; and “social interaction and networking.” For those with mild cognitive impairment (MCI) or in an early stage of dementia, the most popular type of device found in participants’ homes were devices that were categorized as “memory and support of self-care and activities of daily living”, underscoring the importance that technology can play in supporting the memory of older adults with MCI or early stage dementia [15].

HCI researchers have explored self-tracking health-related activities as an application of these devices. Even though memory and support of self-care are popular amongst older adults, some older adults report feeling embarrassed over having others know that they need to rely on external tools to support their memory [16]. They also may have concerns about being overly monitored, or that their actions would either be judged or stigmatized by others [16]. Later in this paper, I explore in more detail what some of these concerns are, and how it emotionally affects participants.

2.2 Best Design Practices for Designing Health and Tracking Technologies

When looking at older adults who are not meeting their health-related goals, there are many points of intervention that can be explored. These include quality and streamlined healthcare, better built environments that invite physical activity, and changing attitudes towards aging. Another approach often taken in technology design research is focusing on the actions individual older adults can take to improve their health; self-tracking technologies are one way that this approach can be applied.

Research on this topic includes how older adults keep track of their health-related data. According to one study, 81% of adults aged 65 and older track health indicators for themselves or others. However, only 3% of those adults use technology to keep track of these indicators [17]. The vast majority of older adults either write down their data on paper or keep track of it in their head [17]. While older adults' lack of technology adoption is not inherently problematic if they truly do not wish to use technology, as discussed above, older adults actually are interested in learning new technologies if they have the proper support and instruction [16].

When examining health technology usage patterns among older adults, previous research on health technology adoption, such as wearable trackers, has indicated that long-term users among older adults are those who have no chronic health conditions, exercise regularly, come from a higher socioeconomic status, and have attained a higher level of education [18]. An explanation for this finding is that older adults from this demographic may have learned the skills or gained the technological literacy necessary to learn to use and maintain wearable physical activity trackers. This study also found that obtaining lower levels of education or coming from a lower

socioeconomic background are positively correlated with abandonment of wearable health technologies [18].

Chronic conditions are also negatively correlated with the likelihood of health technology adoption [18]. This is potentially problematic as older adults with chronic illnesses would arguably benefit the most from long-term use of self-tracking technologies. Though chronic diseases can be complex and influenced by many external factors, such as social or structural inequities, some chronic diseases may effectively be alleviated and managed by engaging in physical activities [18, 31]. However, as discussed above, the majority of older adults are not meeting their recommended level of physical activities.

There are several factors influencing older adults' lack of self-tracking technology adoption. One is the lack of user friendliness that older adults experience when using these technologies. Other reasons are the reduced human contact with health professionals or caregivers, the need for specialized training to use self-tracking devices, and the belief that using these devices is an admittance of decreased independence [19]. In order to mitigate these concerns, Kang et al suggests that self-tracking technologies be as invisible as possible, promoted as a way to increase safety in older adults, and designed as a platform to interact more closely with the healthcare system, rather than being a direct substitute for skilled caregivers [19].

Habit formation is another challenge that older adults face when using self-tracking technologies. Oftentimes, older adults who want to use self-tracking devices will forget to put them on. These lapses in memory have been discouraging to older adults, and caused them to completely

abandon their self-tracking technologies. When studying older adults who have adopted self-tracking devices for long-term use, it has been found that they experience these memory lapses just as their peers do— however, they mentally prepare themselves for this inevitability of memory lapses, and try to maintain a positive mindset about it [20].

Another reason why older adults do not use technology to track their health-related data relate to the aforementioned barriers they generally experience in interacting with new technologies [10]. In particular, the lack of instruction is reinforced by the fact that new technologies often do not come with user guides or manuals [16]. However, it has been shown that once given explicit instruction and guidance, older adults are able to understand and use mobile health intervention technologies [16].

This paper narrates the experiences participants have had with self-tracking technologies— the challenges and successes they have experienced, where the technologies have succeeded and where they have failed. How do these topics affect them? What thoughts and feelings can arise from these affects? This paper does not focus on what they mean, but rather, where might they go?

2.3 How Do Self-tracking Technologies Affect Users Emotionally?

Self-tracking technologies affect users of all ages emotionally in many different ways. Prior research has framed self-tracking as a means of motivation, leveraging both positive and negative emotions to either encourage or shame users into adopting habits that would lead to a healthier lifestyle [26]. Other researchers in HCI have sought to identify the personal benefits

that users would gain from using self-tracking technologies. Such frameworks draw from theories in psychology including gratification theory and social identity theory [26].

However, self-tracking does not just affect the person as an individual, but also, as discussed above, older adults have concerns about how these technologies affect their social interactions with others, as using self-tracking technologies reduce the amount of time they would spend with a health professional or caregiver [19]. Younger adults have found ways to incorporate self-tracking technologies into their social lives and to actually increase social interaction with each other. Lomborg et al found that some adults use Facebook groups as a way to share their health-activity data with each other. Sharing data with others is viewed as a conversation starter with others, or a way to motivate themselves to stay on track to reach their goal after receiving likes and comments from their Facebook friends [21]. However, older adults are less likely to use Facebook than younger adults. In a survey of 142 older adults aged 52-92, the majority of them did not use Facebook. Non-Facebook users were older than their peers who do use Facebook, with the median age of non-Facebook users being 75.3 years old [22]. For older adults who do not use Facebook, or social media in general, this method of using self-tracking technologies to promote social interaction with others may not be appealing or feasible for them.

Additionally, one study found that for some younger and middle-aged adults who regularly use self-tracking technologies, they view these devices as a tool that can help them in the moment, but are not something to be dependent on or to fully rely on [23]. This determination to not let self-tracking devices “rule their lives”, as one participant put it, from younger and middle-aged adults is similar to older adults’ aversion to using self-tracking technologies for supporting

physical and cognitive functions– namely, the embarrassment they feel when admitting that they need external devices to supplement basic functions, such as memory recall or hearing [19]. Given how emotionally charged these topics can be, the goal of this thesis is to present the reader with a raw narrative that captures the scene of how these emotions came to be.

2.4 Summary

While extensive research has been done on older adults' usage of technology and the challenges they face when using self-tracking technologies, not much research has been done as to understanding what the emotions are that older adults experience when discussing these topics. However, understanding these feelings is integral to understanding self-tracking technology usage among older adults with memory concerns, and can in turn lead to better designed technologies for this population. This paper, by focusing on the affective state, seeks to lay out and animate the experiences participants have that evolve into these feelings.

Chapter 3: Methodology

3.1 Participants

Participants were recruited through retirement communities or by word-of-mouth via other community-based organizations who serve populations that are from a low socioeconomic background. Inclusion criteria for participants were that they were at least 60 years of age, and self-identified as having concerns about their memory. In total, I held five rounds of recruitment. 29 participants took part in this study and lived in various places in the United States and the United Kingdom.

For the first round of recruitment, participants were recruited from a group home for low-income older adults in a Midwestern United States suburb. Participants live in a “pod” of four residents, making each living space four bedrooms and one shared kitchen. While six participants were originally recruited for the interview, two participants were removed from the sample because they did not feel that they had concerns about their memory. These interviews lasted roughly 45 minutes, which was shorter than expected.

When reviewing the data, I observed two things: that the interview could have delved more into participants’ motivations, and how they related to tracking; and that some participants were hesitant to talk about their memory concerns. We adjusted the interview script accordingly in preparation for our next round of recruitment. The interview questions now focused more on participants’ motivations for health goals, and asked participants to go in depth as to why each of these goals are important to them. Additionally, if participants were hesitant to talk about memory concerns, we would ask if they can broadly speak to situations that apply to other older adults with memory concerns. In making these changes, I sought to gain both a more thorough understanding of participants’ motivations regarding their health-related goals, and more honest answers from participants.

Five participants were recruited for the second round of interviews. Similarly to the participants recruited in the first round of interviews, these participants also all lived in the same building. In contrast to the first round of participants, this living community was a higher end continuing care retirement community in a different Midwestern United States suburb. Each participant has their own 1-2 bedroom apartment, with a living room and kitchenette. Because the changes to the

interview script asked participants to go into more detail about their health-related goals, the interviews became too long. Participants were only expecting to be interviewed for an hour, and some interviews were up to 90 minutes long. In anticipation for the next round of interviews, I changed the interview script to find ways to shorten interview length without missing out on too much information the participant would otherwise provide. In order to achieve this, I worked on grouping some related health goals together (ie, skincare and dental care) when asking about motivation, and tried to tie health-related goals in more tightly with self-tracking.

Four participants were recruited for the third round of interviews. Each of these participants live independently, but are all clients of the same care manager in a program that has very specific inclusion criteria: clients have to be Jewish, they must have a net income between \$17,500 and \$31,225 USD per year, and they all have to live in a specific service region. This income level is considered to be low-middle income for the geographical area in which participants live. For the first two participants in this interview round, the interviews lasted an hour, but responses regarding health-related goals were heavily focused on physical activity, with no mention of goals for mental wellbeing or cognitive health. For the remaining two participants, I added examples of non-physical activities that can be tracked, such as using a mood journal to track mental wellness. I also reordered questions so that relevant questions were now asked together, rather than at separate points during the interview (eg, when participants list their health-related goals, immediately follow up by asking if they have self-tracked their progress towards these goals, rather than waiting until later in the interview to ask if they have ever engaged in any self-tracking activities).

This interview protocol proved to be effective for the remainder of the interviews, and no further modifications to the interview script were needed. However, of the participants so far who had filled out the demographics form, all identified as being White or Caucasian. As a result, our next rounds of recruitment had a particular emphasis on recruiting people of color to include more racial diversity in the study. Given the mix of income ranges, including low-income older adults, in the first three rounds, we continued to recruit across income ranges: from an exercise grant from a midwestern university where they participate in exercise classes on Zoom, as well as community based organizations who serve low-income populations, who were asked to spread the recruitment material through their networks with a focus on recruiting people of color. 11 of the 15 remaining participants identified as non-white.

Participants' self-identified memory concerns ranged from minor issues, such as memory recall issues that are expected as part of the aging process, to more severe issues, such as having a formal diagnosis of Alzheimer's disease. However, as I will discuss later, even when attributing less severe memory concerns to natural aging, many participants' statements were accompanied by qualifying statements and nuanced emotions that seemed to provide an extra layer of depth to these memory concerns.

3.2 Procedures

3.2.1 Data Collection

All study procedures were approved by the Institutional Review Board at the University of Maryland, College Park, IRB number: 1316631. I conducted 60 minute remote sessions with

participants who met the inclusion criteria, which was to be at least 60 years of age, and self-identify as having memory concerns.

In each session, participants were asked to take part in the following:

1. Verbally complete a questionnaire aimed at finding out about the kinds of physical activities that participants do as part of their everyday lives.
2. Verbally complete a questionnaire to assess sedentary time in their daily lives.
3. Engage in a semi-structured interview
4. Verbally fill out an optional demographics form

Most participants filled out the demographics form, however, there were some who opted not to. While they did not give an explanation as to why they did not wish to fill out the form, one factor to consider is that some participants' eligibility to live in their retirement communities is dependent on their cognitive functioning— that is, if they have memory impairments, they will be forced to move out of the building that they currently live in. Having something as important as their housing be dependent on their cognitive function emphasizes how sensitive participants can be about their memory concerns, and underscores the need to approach this topic with understanding and sensitivity.

Table 1. Participant Demographics

PID	Age	Gender	Race/Ethnicity	Highest Degree/Level of School Completed	Years Lived with Memory Concerns	Confidence Level in Using Technology

1	65	Female	Asian	Master's degree	2	Very confident
2	66	Male	African American	Some college	1	Very confident
3	63	Male	White	Master's degree	6 months	Very confident
4	88	Male	White	Less than a high school diploma	Unsure	Somewhat confident
5	70	Male	White	PhD	5	Somewhat confident
6	81	Male	White	Master's degree	<i>[Did not answer]</i>	Somewhat confident
7	74	Female	White	Some college	2	Only a little confident
8	67	Female	White	Bachelor's degree	"A few"	Only a little confident
9	63	Female	White	Bachelor's degree	10	Somewhat confident
10	62	Male	Asian	Master's degree	6-7	Somewhat confident
11	84	Female	White	Master's degree	3	Somewhat confident
12	65	Female	Asian	MBA	"Always had concerns"	Somewhat confident
13	82	Female	White	Some college	30	Only a little confident
14	64	Female	African	Master's degree	2	Very

			American			confident
15	68	Male	Two or more races	Bachelor's degree	8-10	Somewhat confident
16	61	Female	African American	Bachelor's degree	3	<i>[Did not answer]</i>
17	Did not fill out demographics form					
18	67	Male	Two or more races	Bachelor's degree	"Past few"	Only a little confident
19	60	Male	African American	PhD	5-10	Somewhat confident
20	66	Male	White	Bachelor's degree	2	Very confident
21	61	Female	African American	Associate's Degree	5	Very confident
22	Did not fill out demographics form					
23	Did not fill out demographics form					
24	Did not fill out demographics form					
25	77	Female	White	Less than a high school diploma	4-5	Somewhat confident
26	72	Female	African American	High school diploma	1	Somewhat confident
27	73	Female	White	Master's degree	3-5	Somewhat confident
28	83	Female	White	Master's degree	7+ years	Unsure
29	74	Male	White	Master's degree	Unsure	Mixed

						somewhat to only a little confident
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3.2.2 Analysis

All interviews were audio or video recorded and transcribed for analysis. I then verified and open-coded the transcripts to identify themes in participants' responses. Themes that I initially focused on were what participants' health-related goals are; if they self-track any health-related behaviors, and if so, how they do the tracking; and the role that technology can play in supporting tracking towards their health-related goals. Through reviewing the interviews and the ways participants described their goals and behaviors, I found that these discussions invoked emotions and feelings in participants that were not explicitly said, but rather, conveyed through their tone, cadence, the phrases they chose, and other indicators such as laughter or hesitation. The significance of these emotions or feelings did not necessarily stem from their meaning, but instead, the intensity in which it was conveyed. For a brief moment during these interviews, participants provided me with a vivid glimpse into how the topics being discussed affected them and their lives, and I, too, felt these powerful emotions that the participants had. While traditional qualitative analysis would have no room to discuss these ephemeral moments I experienced, my research instead aims to preserve and expand them due to the richness and deep texture that they offer.

In order to capture these fleeting, yet charged, emotions, I write a series of brief vignettes for the reader. These vignettes are written in a similar style to Stewart's vignettes in her book *Ordinary*

Affects. In this book, Stewart argues for “attention to the affective dimensions of everyday life and the potential that animates the ordinary” [27]. By writing vignettes that capture these attentions, the result is ambiguous scenes that have no precise conclusion. Instead, vignettes are intentionally left with no closure and are intended to be read through several times in order to digest the information and interpret meaning from these scenes. In writing these vignettes, I aim to effectively convey what these raw emotions expressed are by weaving together storytelling, narration, and critical analysis. By guiding the reader along with the text in that way, the goal of these vignettes is for the reader to co-produce the feelings exuded in the text. These vignettes aim to provide readers with the same evocative glance into participants’ lives that I was offered during the interviews.

Vignettes were written and analyzed in several iterations. After open-coding the transcripts, I would write a vignette, and then share it, along with the direct quotes I pulled from, with my thesis advisor and a collaborator, Norman Makoto Su from the University of California, Santa Cruz. Researchers then provided feedback on the vignette, how clearly and effectively the affect was coming through, and we would then examine the direct quotes from participants again to refine the vignettes to effectively capture the emotions being expressed.


3.2.3 Writing Style

Leaning upon prior work in affective vignettes in HCI, the following notation is used to help guide the reader through the various stories and emotions that have emerged from these interviews [24]:

THEME 1

This is the researchers' voice (V_1). This text is our interpretation of the scenes that follow (S_1, S_2, \dots). It acts as commentary to guide the reader between scenes and sections.



The above fleuron () acts as a separator from the researchers' voice and the scenes.

Scene 1. This is a scene (S_1) from a single informant pertaining to V_1 . This writing style allows the reader to see each scene as “happening” to a character. Scenes have a descriptive title, are written in the third person and derive from our interview transcripts, often using the speaking style or direct words of informants.

Scene 2. This is another scene (S_2) providing another informant experience pertaining to V_1 .
...

Subtheme

This is the researchers' voice (V_{1_1}) and interprets a particular aspect of Theme 1. The scenes (S_{1_1}, S_{2_1}, \dots) that follow pertain to V_{1_1} .



Scene 1₁. This is a scene (S_{1_1}) from one informant pertaining to $V_{1_1} \dots$

Some of the scenes written are taken from one specific instance in the interview, while other scenes bring together sentiments, as well as other data expressed throughout the entire interview. In total, 32 vignettes were written. Some vignettes were removed either due to being irrelevant and not providing us with any insight into how it shapes their view of health or self-tracking technologies, or because the sentiment expressed in the vignette was similar to another and was therefore removed to avoid redundancy. The vignettes that were kept were grouped into themes based on affect, and then the themes were further arranged into a narrative that is outlined in this paper.

In the scenes, the word “I” is used to denote my thoughts and reactions during the interview, whereas the word “we” is used to indicate reflections of myself and/or the research team when looking back on the data during analysis.

Chapter 4: Results

4.1 Goals and How They Are Achieved

When looking at the health-related goals that participants have, not every participant tracks their progress towards these goals, and even fewer of these participants use technology for this tracking.

By “technology”, I refer to any device that requires batteries or electricity to use. Some participants cited use of common devices that had more advanced technology features. For example, one participant uses a blood pressure monitor that has Bluetooth capabilities. While other participants said that they used blood pressure monitors as well, they did not specify if these machines had additional technological features or not. As a result, I considered every instance of using a blood pressure monitoring machine to be technology use.

Table 2. Health-Related Goals Participants Have

Goal	Number of Participants	# Who Track	# Who Use Tech	# Instructed to Track by an Authoritative Body?
Maintain or increase physical activity	21	8 (38.1%)	5 (23.8%)	2 (9.5%)
Weight	15	8 (53.3%)	5 (33.3%)	1 (6.6%)

loss/management				
Have a better diet	10	3 (30%)	3 (30%)	1 (10%)
Improve or maintain mental wellness	8	1 (12.5%)	0 (0%)	0 (0%)
Improve or maintain cognitive function or memory	6	0 (0%)	0 (0%)	0 (0%)
Improve or maintain blood pressure	6	6 (100%)	6 (100%)	6 (100%)
Generally be healthy	5	0 (0%)	0 (0%)	0 (0%)
Improve or maintain blood glucose levels	4	4 (100%)	4 (100%)	4 (100%)
Improve sleep	3	2 (66.6%)	2 (66.6%)	1 (33.3%)
Miscellaneous health goals	2	0 (0%)	0 (0%)	0 (0%)

Of the goals that participants track progress towards, a large number of these goals were set or recommended to them by a doctor, healthcare professional, or any other outside authoritative body. For these participants, they view self-tracking as a necessity or obligation– something that they need to do in order to maintain their health or achieve a goal. This is in direct contrast with

participants who have taken the initiative to engage in self-tracking behaviors without any external recommendations or order. For those participants, they often notice issues with their own health or wellbeing and want to keep track of their symptoms or prognosis. Very few participants reported having no health issues and still took the initiative to self-track their health behavior. Further research is needed to determine if this is a coincidence, or if health issues are a driving factor for older adults with memory concerns to adopt self-tracking behaviors.

Participants' goals for monitoring and tracking also varied. Some had a tangible goal they wanted to meet, such as walking 3 miles a day, and felt that self-tracking could help them achieve that goal. Other participants wanted to keep an eye on their health issues, making sure that symptoms are not worsening, even if they have no hope that their conditions will improve over time.

The vignettes below not only identify the challenges and successes that participants experience when tracking progress towards achieving their health-related goals, especially using technology, but also provide insights into the emotions that drive these experiences.

4.2 Vignettes and Affective Scenes

4.2.1 Feeling Stalled

A few participants are facing challenges that have left them feeling lost or without a sense of direction. Some may have some idea of how to move forward, but for various reasons, they *can't* right now.



Lack of companionship is a major, major setback for exercise. Two health-related goals P19 shared were to decrease loneliness and increase socialization. He spends almost all of his time alone, being single and living by himself. He told me that he used to be very into fitness, bodybuilding, and all of that, but stopped 20 years ago. Now, he has been trying to reignite that motivation. He is trying to locate a person who works out at the same gym or at the same time.

His difficulty finding someone is a major, major setback for him to begin weightlifting again. If it is just him exercising by himself, he feels that he can let himself down. However, if he has made arrangements with another person, he says that he'll feel a sense of accountability to be responsible to follow through with those plans.

This accountability is so important to him that he'll be sure to set an alarm on his phone so he doesn't forget about engagements; he says these alarms are very crucial in helping him to remember the small things he has scheduled with others throughout the day. He gave the example of setting an alarm to show up for this study. He's concerned that his memory lapses will affect his ability to follow through with plans. What concerns him most about this is that it will affect his integrity in being accountable to his commitments.

Isolated and lost progress in the midst of the unknown. P13 had started physical therapy to strengthen her core muscles and bladder. However, the COVID-19 pandemic meant that she was quarantined and she couldn't go to the physical therapy program anymore.

The pandemic and its consequences, most notably the death tolls, were something that she wasn't accustomed to hearing as this is the first pandemic she has experienced, and she felt that it was devastating. She found herself crying so frequently that her doctor prescribed her a low dose of an antidepressant. Many of her usual coping mechanisms like going out shopping or meal time with friends and family had been shut down or discontinued due to the pandemic. She felt that the things that had really helped her in the past weren't available to her anymore, and she's lost progress she's made in some of her programs like physical therapy. She doesn't sound like she is pushing herself to return to normal life. Rather, she says she hopes when things are better she can allow herself to get back to this - she'll be trying to start over on her own, when she is ready.

4.2.2 Looking Forward

Some participants worry about things in the future— things to come. How is their health going to be in several years? What will the world and society look like as their grandchildren age? Are they going to remain financially secure? These aren't issues that affect them right now, but rather, issues that are on the horizon and may affect them later on.



Wanting a better world for future generations. When asked about her health-related goals, P7 said that she wants to stay active. For her, part of this means following politics, following what's going on in the world, and just trying to stay engaged in society. She does this in part because she'd like to believe that there's something she can do to fix the issues she's observing in the world. Keeping up with politics and news has always been important to her, but even more so

now that she has grandchildren. She wants to see a good world for her granddaughters. She says she doesn't think there is anything that she personally can do. But in the next breath, she says she tries to stay aware so she can fix something - if she can. The thought that there is something she might be able to do is always in the back of her mind.

Living too long. P29 says that they are in good health, but feels conflicted about it. Being too healthy means that they could live too long and run out of money. As they are retired, they are currently living on their savings. They have enough, but not much extra. They want to lose weight to ease the pain on their joints caused by arthritis, but not lose so much weight that they have to buy new clothes.

On the one hand, they want to be healthy and feel good, but the idea of living longer than their money isn't appealing. Their friend has run out of money and has a poor quality of life. This friend is physically not very capable, and currently unable to have visitors because of the pandemic. He has an old desktop computer that he wishes to replace, but does not have the money to do so. While he isn't planning on harming himself, he does wish that he would die. While their friend is quite a bit older than them, with him being in his 90s and them being 10 years younger, P29 worries that this could be in their future if they are too healthy.

If you notice something, be sure and tell me. P11's husband had serious dementia towards the end of his life, to the point where he forgot how to eat. If there were TVs, computers around, he couldn't figure out how to turn them on. Now that she's seen that, she has some concern that this could happen to her. She uses tools to help manage her memory changes, like setting out her

equipment the night before, making lists, and she thinks it helps. She doesn't think her memory changes are a concern now. But, she realizes that she might not be aware of the things she is forgetting.

She's told her kids, "If you notice something, be sure and tell me". She doesn't want her memory changes to be a problem between her and her kids. I was thinking this might be her reflecting on her experience of dealing with her husband's condition, that she's more worried about how her memory loss is going to affect the ones around her more than how it will affect herself.

4.2.3 Being Engaged in the Moment

Many participants emphasize the importance of being engaged in the world around them. For a lot of these participants, this means going outside and being with nature. For others, this means keeping up with the news and knowing what is going on in the world and society.



Wildlife lover. P11 gushed about how much she loved the campus grounds, and seemed to have an emotional attachment to the wildlife that she would observe. During her daily walks, she makes sure to stop by the aviary. Once there, she makes sure that all 15 birds are still there, though it is hard to count them because they move around so quickly.

When she walks outside, she wants to see what things are blooming in the garden or if the fountains have been turned on yet, which, due to how early she takes her walks, she knows they

haven't yet. Still, she likes to keep tabs on the things that are happening in her living complex. She finds it fun to encounter other people on her walk so she can say hello, ask how they are doing, and talk with them a bit.

Take the good with the bad. P29 likes to follow current events and thinks it's important to pay attention to what is happening in the world. However, he acknowledges that some of what he sees makes him uncomfortable. He says that he will take the uncomfortable part as long as he can engage.

4.2.4 Complicated Experiences with Healthcare

Many participants have had complicated experiences with healthcare providers, but they've handled those experiences in different ways. Some have been left feeling lost or without a sense of guidance after receiving unactionable feedback; one participant was even left with a sense of loathing towards the healthcare system.



I loathe the healthcare system. P20 has had severe sleep issues for nearly 30 years, not having slept well since the 90s. He lost both his partner and his mother within a short timespan, and the trauma of those losses has caused a disruption in his sleep schedule. This is particularly worrisome as he says sleeping well is important to people who have HIV.

When he saw a doctor for his sleep issues, they prescribed him medication without telling him that it was addictive. Twenty-five years later, he doubled the dosage of his medicine, and he still was unable to sleep. It took him three years to wean himself off of that medication and has since been prescribed a different one; he laments that he is still taking something to help him sleep. He questions if his sleep issues are simply physical, or if they are attributed to the trauma he has experienced. He blames the whole medical community for not trying harder to figure out why he wasn't sleeping; he blames all of them for that. He knows that he shouldn't elaborate his feelings in "mixed company", but it makes him feel angry, and he loathes the healthcare system in this country. As a former HIPAA officer, he knows what the healthcare system does, and how it works. He, and millions of others, he says, are victims of the healthcare system.

I didn't feel taken seriously. P10 has had concerns with his short-term memory loss. He didn't find that he had a massive drop off in his memory, but he was concerned enough that he wanted to see his doctor and ask if he needed to go to a memory clinic. To his disappointment, the doctor basically gave him a test for dementia— giving him easy tasks like drawing a house or a clock face. Laughing dryly as he recalls the appointment, he remembers thinking "Doctor, this is not really what I'm talking about".

Still, there was one significant part of the exam that had left him feeling unsettled. He was asked to name nouns starting with a certain letter, and he didn't do well on that. As someone whose job depends on quickness of language, this bothered him, as his work has a lot to do with words. His doctor said that there's maybe something there, but never followed up on what the issue could be. P10 felt disappointed. He didn't feel taken seriously, and it wasn't a nice feeling for him.

4.2.5 Medical Advice

Reactions to medical advice and feedback varied, with one participant letting her doctor have the final say regarding her health issues, while another participant disregarded medical advice entirely.



Leaving it up to the doctor. Concerned about her memory, P28 purchased a book by the Massachusetts General Hospital titled “Combating Memory Loss”. She hasn’t read the entire book, but she’s read parts that are relevant to her. At one point, her readings led her to believe that she could make lifestyle changes that would combat her memory loss. When she went and brought it up to her doctor, he didn’t seem to think that was the case. Instead, he simply administers memory tests such as drawing a house or repeating after him, and tries to figure out how quickly her memory is changing or not changing.

It was strange to her to have her healthcare provider contradict what she had previously researched on her own, and that was sort of the end of the discussion. It’s disappointing that her doctor doesn’t give her anything to feel like there’s a chance of combatting this memory loss. She doesn’t completely believe her doctor that nothing can be done, because she has read from multiple outside sources that that isn’t the case.

Trust in himself over the doctor. P28 wants to improve his memory and recall ability, noting that things get away from him when he's trying to remember them. To achieve this, he has been taking over the counter supplements that are supposed to help him. He heard about these supplements from television ads and his sister's recommendation. He says that the supplements seem to be helping; at least, he doesn't have the fogginess that he used to have. Though he has noticed improvements, he knows that this is an unconventional treatment for his memory problems. He told his doctor that he was taking these supplements, but expected a negative response. When I asked what his doctor said, he laughed heartily, saying "Now, what do you think the doctor said?". Of course the doctor doesn't have much faith in these supplements. In fact, the doctor recommended that he stop taking the supplements as he was taking vitamin D supplements at the same time. "Stop taking that because together, it's too much vitamin D." However, instead of stopping the memory supplements, he stopped taking the vitamin D pills.

Still, he did take his doctor's advice into consideration. The vitamin D was important to him because he has osteopenia, "halfway to osteoporosis", as he calls it. After two months, he ran out of memory supplements. He switched to a different brand that didn't have vitamin D so he could start taking the vitamin D supplements again.

I don't want to look like death eating crackers. P26 has bilateral knee replacements, but feels much better recently because she dropped about 10 pounds. Even though the BMI charts say she should lose another 10 pounds, she doesn't want to lose that weight— she doesn't want to look like death eating crackers¹. She's been getting compliments. Everyone tells her that she looks

¹ an expression that refers to someone so dried up and old that they are near death

good, and more importantly, she *feels* good. She can move around easier and her self-esteem is good. She doesn't want that to change— she wants to maintain where she's at.

4.2.6 Inevitable but Intervenable

Some participants have aspects of their health that they feel are irreversible. Maybe a doctor has explicitly told them so, or maybe they just know their body well enough over the decades they have lived to know that change isn't possible. Still, participants haven't totally given up. They're not trying to get better, but they instead are trying to take care of themselves, to delay the prognosis of their conditions or maintain how they currently feel.



It's just a pipe dream. When asked about their health-related goals, P24 immediately said weight. P24 has always been on the heavier side. They remember this goal of losing weight as early as grade school, when they daydreamed of having their legs thinner than the student in front of them. Working nights for many years destroyed their eating and sleeping habits, and cooking for four boys didn't help either. Now, at 84, they say it looks like they're never gonna make it, because that is just how their body works. They say it is more of a dream than a goal.

They say they're in pretty good health, knock on wood, and they realize that the weight goal is more appearance-based than anything else. A breath later, though, they say that they can't tolerate seeing an exact number for their weight. They try not to use the scale. It's hidden. They can tell how they are doing by the fit of their clothes; by how they feel.

Keeping at peace. P1 has been diagnosed with pulmonary hypertension, a disease that narrows lung arteries. The diagnosis was life-changing. Her heart has to work harder now to pump oxygen into her lungs, so as a result, her doctor gave her a cannula to get supplemental oxygen. She has to be hooked up to a tube that delivers oxygen directly to her nostrils.

She tries to remain mentally healthy like being stable or at peace because this disease has caused her to have depression. That's just natural. Anyone who has chronic illness and tells you that they're not depressed about it isn't facing reality. This is the kind of illness that you need to go through the five stages of grief in order to cope with it. Grief, acceptance and even anger. It's so different of a life that you have now.

Do what they can. P22 talks about the various health problems they have. They have been diagnosed with emphysema (a disease that affects lung tissue), and Alzheimer's, though they suspect they have Lewy Body dementia because of their significant balance. They explain with resignation that they think that these issues are irreversible. They don't have much hope that these will improve.

Their physical activity levels have been severely impacted by these conditions. The emphysema means that they cannot run anymore, and have to walk everywhere. However, walking is an issue for him because of the suspected Lewy body's disease. This affects their balance and they find it to be a major obstruction when taking walks. They'll have to keep hold of the walls for balance,

or keep their eyes on the pavement in order to not lose balance. They also walk in the yard- sometimes they'll go to the park- and bicycle indoors for quite some time when it rains.

These examples show the work they do to stay physically active in face of the changes they are experiencing. They are highly motivated to stay active, and they explain that this “controls quality of life” – they feel both mentally and physically better.

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4.2.7 Denial and Pride

A couple of participants recognize that their decline in memory means that they should start using external tools to help support them in their daily lives. Still, they're emotionally not ready to accept that. While they're cognizant that they forget things more easily now, they don't want to accept that their memory is in decline – they should still be able to rely on their memory alone.



Pride gets in the way. P18 sometimes will get confused and forgets if he took his diabetes medication or not. He'll take a while to stand and think about it, asking himself “did I take my medicine?”. He's unsure, thinking maybe he did take it, maybe he didn't.

He doesn't write down on a chart if he's remembered to take his diabetes medicine or not, but he admits sometimes he should. When asked why he hasn't yet, he says that he supposes he hasn't taken the initiative to do so, and eventually admits, laughing dryly, that when he really thinks about it, maybe it's a matter of pride.

4.2.7 Adapting (or not) to Technology

Participants expressed mixed feelings to the ever-increasing presence of technology. Some are excited, curious about the possibilities of how technology can help them in their daily lives. Others have a disdain for technology's pervasiveness and how dependent our lives are on them.



Keeps me on target. P16 uses many different apps on her phone, tracking sleep. Calories. Activity in general. Her GERD. Changes in her body, BMI, lean mass. She finds that these different apps keep her on target. When she goes to the doctor, she won't remember what symptoms she had or what her weight was six months ago. The self-tracking apps she keeps on her phone allows her to look back at and reflect on what has been going on with her health, allowing her to give a more accurate picture of her health to her doctor.

The number of apps she uses can be overwhelming and anxiety-provoking, to the point where she likens it to OCD. It throws her off every once in a while, but she acknowledges that she would not be able to maneuver throughout her day without those apps. In order to make things less overwhelming, she will assess the apps she has every few months, take away some of the apps that she doesn't use, and only keep the important ones. This helps her only have a set

number of apps on her phone at any time. An example she gives is if she removes her fitness tracking app and sees that she put on 40 pounds, she'll put the fitness app back on her phone so she can figure out what in her habits she's been doing wrong. After re-downloading the app, she'll try to delete another app, otherwise there will be too many apps on her phone.

Technology isn't something to worship. P20 strongly dislikes technology. He raises issues of pervasiveness and security issues, bringing up his past as a HIPAA officer. His dislike seems bigger than these two things- he says that technology doesn't pass the smell test for him.

He doesn't have social media because he doesn't like social media. He doesn't even have a smartphone and hasn't taken the screen protection film off of his old phone. He begins to explain his feelings on social media, but stops himself short, saying he doesn't want to get into it. From my perspective, it felt like he realized it wasn't an appropriate time to voice his strong opinions. To him, technology isn't something to "worship" – it's just there. He had to deal with it for decades at work and is comfortable using it, but he just doesn't care about it.

It's not you, it's me. P11 used to keep track of the number of steps she took using her smartphone. She had an app on her phone, but then the phone (or the app?) ceased to work, so she ceased to keep track of her steps. She qualified that statement saying it might have something to do with her lack of knowledge as to what settings she should be using.

She supposes that she could search for a different app to use, but keeping track of the number of steps she takes a day just isn't that important to her. It was interesting for her to just look at when she had the convenience of a working app, but she doesn't overly miss it..

It just seems like a novelty. P15 very much wants technology to be his personal assistant. After reading what technology can do for people in his age group, he wants technology to hurry up and help him. He reads things that sound like “In three to five years, technology is coming to help elderly people, to help you stay at home and function well” – things that people in his age group pay attention to. He thinks that the interview with me hits on a lot of key points for what he wants technology to help him with. He already describes himself as being an active person, playing tennis and taking hikes, but he can just imagine sophisticated ways that technology could advance to benefit him.

However, he doesn't feel like anything on the market can meet his needs yet. His boyfriend has an Alexa, but P15 just finds it annoying as it breaks down sometimes. As it stands, he doesn't see Alexa as a real high-tech advantage– it just seems like a novelty.

He needs to repeat things several times when he's trying to get a song to play or to turn off a light. Right now, he feels that Alexa needs to be smoother and to actually lift the quality of his life in some fashion. Still, he knows plenty of people who feel like Alexa is already at that point.

I don't like being told what to do. P20 has no interest in self-tracking technologies, nor does he understand why other people use them. He views himself as more of a “common sense” type,

and implies that using self-tracking technologies goes against common sense. He believes that people who use self-tracking technologies are mostly concerned with having the latest toy. Why would someone need an electronic device to tell them what to do when they can go out in their own backyard and exercise?

He says, with his tone short and visibility agitated, he doesn't like being told what to do. To him, self-tracking technologies are just micromanaging activities more than it needs to be. Does it really matter that he knows he exercises for 18 minutes one day, and then 40 minutes the next? It's creating all this new stress over activities, when activities are what is supposed to be relieving stress in the first place.

Chapter 5: Discussion

This thesis presents these narratives— not with the goal of coming to a conclusion, or assign meaning to them— but to get a glimpse into the animated intersection of lived experiences, attitudes, and views as a way to visualize what emotions and actions might spring from these crossroads and where they may go. Such visualizations allow us to analyze findings both empirically, as well as make further methodological contributions to better understand how to engage with this population and introduce design opportunities for future technologies.

5.1 Self-Tracking

As discussed above, some participants had concrete goals they made actionable steps towards, while others were more transitory. Some chose to track their progress, while others actively made

sure they could not interact with their health data. Though thoroughly varied, all of these emotions and sentiments have implications for future analysis, research, or designs that are to be done in this field.

5.1.1 Expanding the Notion of Tracking

In section 4.1, I discuss what health-related activities participants currently track in their daily lives. However, even though this interview focused on tracking health-related data, some participants mentioned other things they would track, and how it made them feel. By slowing our analysis to expand on these scenes, we are offered a brief look at *what* in participants' lives made them feel that way. While many studies exist on self-tracking non-health related data, the participants in these studies often are not older adults [32, 33]. Research regarding older adults' self-tracking behaviors are frequently about health-related data that directly impacts their health [34, 35].

One study argues that current research regarding older adults and physical activity tracking systems does not adequately address the role older adults can have during design and development [18]. Special care needs to be taken to the hedonic needs and preferences of the user, including what feelings, memories, and emotions using self-tracking technologies can invoke. Affective writing and analysis allow us to fill in this gap. For example, while P5's daily habit of making sure all 15 birds are still in the aviary is not directly relevant to the topic of self-tracking health data, it offers us an insight into her exercise habits and priorities. This immersion in her surroundings is important to her— to be able see what is blooming in the gardens, to be able to say hi to people on her walks. The vividness in which she describes her

day helps us as researchers and readers to understand her needs, and what she finds enjoyable in her daily walks.

By expanding our definition of self-tracking and exploring why this is important to older adults with memory concerns, future designers and researchers can in turn explore broader applications of self-tracking technologies that can include the interests and preferences of this population.

5.1.2 What are Some of the Barriers to Self-Tracking Health Behaviors?

As discussed in section 4.1, weight loss was a common goal among participants, but many chose not to track progress towards this goal. A common reason cited for not wanting to track weight loss was because of the mental strain and stress that seeing their weight causes them.

Existing research shows that the majority of existing technologies help to passively monitor older adults' health indicators, but not as many actively guide older adults to meet their health-related goals. Vargemidis et. al argues for technologies for older adults to be more user-friendly so that self-tracking technologies can incorporate activities they find enjoyable in a way that aligns with their preferences and needs [28]. However, as illustrated above, participants' needs are seemingly contradictory. As written in the vignette above, P12 cannot tolerate seeing her weight, going as far as to hide the scale and using the fit of her clothes to gauge her current weight. She has this goal of weight loss, but also feels it is impossible to achieve.

This has implications for future designs, as perhaps self-tracking technologies should explore tracking data that participants are less sensitive about. For example, P12 uses the fit of her clothes to gauge her weight, rather than an exact data point. Technology designers should note the emotionally charged aspects of self-tracking and find alternatives that align with older adults with memory concerns' needs to make self-tracking user friendly and useful to them.

In writing analysis in an affective style versus using traditional qualitative methods, we do not just learn that seeing their weight is stressful to participants– we also gain an insight into the world in which this stress exists, the contradictory insights that they provide, and the actions that they take. What affective writing tells us is not just that P12's weight and goal of weight loss causes her stress, but it also conveys to us the resignation she feels and the coping mechanisms she has developed in order to live with these emotions.

5.1.3 Immersion versus Technology

Many participants emphasize the importance of being engaged in the world around them. For a lot of these participants, this means going outside and being with nature, and actively leaving their phone and technology behind; technology usage and exercising outdoors is mutually exclusive.

One study has reported similar findings, stating that patients with early to moderate dementia value being outdoors, and feel that it significantly contributes to their overall quality of life.

Participants cite cherishing the outdoor environment, the opportunity to interact with others, and the exercise benefits that being outdoors bring as reasons for wanting to be outdoors [36].

For participants who used to view technology as at most, a supplement, something that was just *there*, what does the expanding role of technology in their lives mean to them? How accepting of these changes will they be? Further research is needed to explore if there is a unique way self-tracking technologies that require interaction in the moment can still be beneficial for these participants.

Other participants embrace the changes that technology can bring to their lives. This thesis touched on some potential uses of technology that excite them, but future designers and researchers should expand these narratives more to identify ways to incorporate these enthusiasms into future self-tracking technology designs.

5.2 Salient Themes and What They Mean

While not every scene listed in the vignettes is explicitly related to self-tracking technologies, they do give us an understanding into the tangentially related factors and experiences that shape participants' views of health and self-tracking technologies.

5.2.1 Trust in Healthcare Providers versus Trust in Themselves

As indicated in the vignettes, some participants have had negative experiences with healthcare professionals, ranging from confusion due to a lack of guidance, feelings of neglect, or an outright loathing. While the emotions they felt varied, all of the participants who expressed dissatisfaction with healthcare providers did so because they had approached their doctors with more serious health concerns that they felt were impeding their daily functions. This observation

is supported by prior research in this area; there is a positive correlation between older adults who have more functional impairments and limitations and expressed dissatisfaction and a less positive evaluation of their healthcare providers [25].

Not only has this research has shown that some participants have had negative experiences with their healthcare providers, but we also gain an insight into how participants have responded to these encounters. Some participants implied that they had given up, believing that their doctor had the final say in their health prognoses. Other participants seem to have taken their doctor's feedback much more loosely, seemingly acknowledging that while their doctor's advice may have some legitimacy, they ultimately place more trust in their own observations of their health and base their healthcare decisions around how they are feeling about themselves. While some research in this field is grounded in the assumption that older adults are willing to and want to share data with their doctors [29], these vignettes show that there exists nuanced complexities that might challenge this assumption.

5.2.2 Holistic Approach to Health

Many participants have expressed the interconnectivity that mental, cognitive, and physical health have in their daily lives. For some participants, they feel that engaging in physical activity helps improve their mental and cognitive health. For others, their highest priority is always their mental wellbeing; they cannot work on their physical or cognitive well being if their mental health is not stable.

This sentiment is supported by one research's findings; researchers found that participants who have mild to moderate dementia feel that both physical and emotional well-being contributes to an elevated quality of life and may extend participants' ability to live independently [36].

These sentiments did not surface in response to a question. Rather, participants took the initiative to share these beliefs when talking about health in general, highlighting how important this outlook on health is to them. This can have implications for future design of self-tracking technologies, as it shows that not only physical activity should be tracked, but mental and cognitive as well.

5.3 Examining Where Self-Tracking Technologies Are Succeeding and Where They Are Failing in Participants' Lives

Of participants who either regularly use self-tracking technologies or have tried technologies in the past and enjoyed the experience, common reasons cited for their enjoyment were the visualizations of their health-related data, a feeling that self-tracking technologies help them achieve their goals, and a sense of accomplishment felt when their goal was achieved. However, many of the participants who said that they enjoyed the experience of using self-tracking technologies did not adopt the technology for long-term, everyday usage.

The cost of replacing lost devices; the time, effort, and technological literacy needed to repair and maintain devices; or a general loss of interest are common reasons cited as to why self-tracking technologies were not adopted for long-term usage. This is in line with prior research that explores technology usage patterns of older adults [18].

For participants who have no interest in adopting self-tracking technologies, the most common reason given was that it was viewed as a chore or burden. As discussed above, it is difficult for older adults to adopt new habits into their daily routines, and setbacks in maintaining routines can be discouraging for them.

One study has supported these findings, stating that older adults' willingness to invest both their effort and personal finances are barriers to using new technologies. However, they acknowledge that future research needs to be done to understand the longitudinal effects of both the personal and social contexts in participants' lives, and how that shapes their perception of technology [30]. This research aims to do so by providing a more intimate narrative and empirical account of how older adults with memory concerns view self-tracking technologies, touching upon struggles older adults with memory concerns may have with finances, technological literacy, or the emotional burden of using self-tracking devices.

5.4 Summary

The vignettes presented offer more context and discernment into the points discussed above. While we refrain from making our own assumptions, conclusions, or formal analyses, we are given a textured insight as to how participants describe their emotions, where they stem from, and how participants cope with them. They capture the fleeting moments in the interviews where participants mention, perhaps impulsively or simply in passing, things that happen in their lives.

Chapter 6: Limitations and Future Work

6.1 Limitations

One limitation to consider is that because I spoke with participants who have memory concerns, they may not recall information about their daily habits. As a result, I may not have received a fully accurate account as to which self-tracking behaviors participants regularly engage in.

Another limitation to consider is that, as discussed, at the time of interviews (2021-2022), political issues, social unrest, and the COVID-19 pandemic had an effect on some participants' mental health, physical health, and social activity. These external circumstances influenced the emotions and feelings expressed in interviews, and may not have been present if these extraordinary situations had not happened.

A third limitation is with the style of affective writing. By its nature, affective writing seeks to illuminate situations and contexts from which thoughts and emotions arise. The vignettes written point to potential design implications for self-tracking technologies for older adults with memory concerns. However, the implications discussed above are just a few indications as to how vignettes and affective writing can be translated into concrete, actionable guidelines for future researchers and designers to use. Vignettes give us portraits of participants' lives, but intentionally leave us with no closure. Further research is required if we wish to draw concrete conclusions that can shape future designs or engagement in this field.

6.2 Future Work

This thesis aimed to explore and convey to the reader the ways that health-related goals and self-tracking technologies affect the everyday lives of older adults. Seemingly similar feelings and emotions are revealed to stem from vastly different life experiences, and as such, cannot be grouped in the same categorization. Additional probing is needed to find ways to translate these affects into designs that can better support older adults with memory concerns.

Conclusion

In taking an affective writing approach, I pause the jump from open and focused coding to representational thinking. Instead, this thesis offers a slowed empirical narrative that captures ephemeral, yet captivating and emotionally charged moments—moments that otherwise would be overlooked in traditional qualitative analysis. While we know that one approach to increasing physical activity focuses on actions the individual can take, specifically through self-tracking technologies to encourage activity, my research focuses on how that makes older adults with memory concerns feel. How does this affect their daily lives? What is important to them and why? By taking a deeper exploration into the individual portraits that participants have shared with me, I hope that this research can serve as a foundation that inspires further exploration into participants' emotions and motivations: expanding the narrative provided, uncovering new stories, and rendering these accounts into tangible guidelines that can help shape how future self-tracking technology is designed for older adults with memory concerns.

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