

Working Together in a PhamilySpace: Facilitating Collaboration on Healthy Behaviors Over Distance

JOMARA SANDBULTE, University of Minnesota Duluth, USA

CHUN-HUA TSAI, The Pennsylvania State University, USA

JOHN M. CARROLL, The Pennsylvania State University, USA

Studies have shown that interpersonal relationships such as families and friends are an important source of support and encouragement to those who seek to engage in healthier habits. However, challenges related to geographic distance may hinder those relationships from fully collaborating and engaging in healthy living together. To explore this domain, we developed and deployed a lightweight photo-based application called PhamilySpace with a week-long intervention. Our goal is to examine family members' and friends' engagement and awareness on healthy behaviors while living apart. Our analysis of the semi-structured interviews, pre/post-intervention instruments, and application logs suggests three main benefits of interventions for health promotion in this context: (1) increased awareness on acts of health; (2) reciprocal sharing of health information supports social accountability over distance; and (3) positive dialogue around health enhances support on healthy living. By providing insights into distributed family/friends interactions and experiences with the application, we identify benefits, challenges, and opportunities for future design interventions that promote healthy behaviors.

CCS Concepts: • **Human-centered computing** → **Field studies**; *Social networking sites*.

Additional Key Words and Phrases: healthy living; collaboration; geographic distance; social support; awareness; engagement; family; friends; field study

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1 INTRODUCTION

Promotion of health is an important process that involves a combination of different components such as health education and health promotion programs to help individuals make informed decisions about their health and learn strategies for disease prevention [29, 36]. It aims at increasing individuals' good health outcome, even when facing adverse events such as stress [5]. Furthermore, going beyond the individual level, interpersonal relationships such as family and friends play a central role in helping individuals achieve positive health outcomes [29], for example, through positive support in living healthily (e.g., advice and care, encouraging optimism) [53, 74]. However, prior works have raised concerns on how poor quality of interpersonal relationships may cause strain (e.g., criticism, arguments) and influence one's well-being negatively [1, 2, 77]. For example,

Authors' addresses: Jomara Sandbulte, University of Minnesota Duluth, Computer Science Department, Duluth, MN, 55812, USA, jsandbul@d.umn.edu; Chun-Hua Tsai, The Pennsylvania State University, University Park, PA, USA, ctsai@psu.edu; John M. Carroll, The Pennsylvania State University, University Park, PA, USA, jmc56@psu.edu.

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some families' environments can often be tense and individuals might choose to *not share* their experiences due to the family's lack of interest on their attempts to be healthy [20]. Also, sharing health information at online communities may cause concerns with self-presentation [51] and privacy [49]. Therefore, there is an opportunity for researchers to design solutions that nurture individuals' health-related goals and motivate them in helping others in living healthy.

For individuals, health applications can help with data collection for increasing self-knowledge and to motivate them on improving their health [28, 44]. As for interpersonal relationships such as families, health applications can engage members in healthy living collectively, for example, by encouraging reflections on health [33], helping to improve eating habits [45, 69] and motivating physical activity practices [43, 65, 68]. These studies had presented valuable insights on user engagement on health applications [28] and on the importance of social participation to maintain engagement on health [33, 45]. Still, questions remain on how to develop effective health applications that sustain one's engagement once novelty fades [28, 65]. Furthermore, much of the prior sociotechnical interventions for health promotion focusing on families have examined groups of families living together [33, 45, 65, 68, 69] and have considered single aspects of healthy living such as eating habits [33, 45, 55, 69] and physical activity [43, 65, 68]. Designing technologies that are appropriated to the needs of contemporary families with diverse structures and situations are still underexplored [41].

We echo these prior works of health promotion by designing *PhamilySpace*, a lightweight photo-based application that provides a space for family members and friends to share, communicate, and encourage one another on healthy behaviors. Due to the demonstrated value of social support on health promotion [29] and the increased number of individuals in relationships living apart [52, 71, 83], we consider the social dynamics between family members and close friends living apart in our study design.

More specifically, our study design differs from prior studies in four main ways. First, our study focuses on distributed individuals and considers the family relationship between elderly parents and adult children, and close friends. Second, our study design aims to examine how a lightweight photo-based application can help distributed people to be more *engaged* in conversations about health and to be more *aware* of each other's healthy practices as a way to support collaborative interactions around health over distance. Third, our system deployment also extends the supportive environment that physical proximity can bring to the virtual realm to encourage healthy behaviors throughout the day not only within families, but also friends. Finally, we consider health as a form of dynamic *collective practices* that comprises individuals' physical, mental, and social well-being as a way to empowers them on staying active based on their skills, abilities, and practices even when facing adverse conditions [5]. In this study, we investigated the following research questions:

RQ1. How can a lightweight photo-based application help distributed families/friends to be more engaged in healthy living?

Whereas prior works have studied interpersonal relations (e.g., families) engagement in technology-mediated health and wellness interventions [68, 69], we wanted to examine how distributed families/friends can engage with the application in promoting and perceiving healthy living over distance. We expected that the unique characteristics of family groups and close friends (e.g., strong ties) could lead to one's increased engagement on health.

RQ2a. How can a lightweight photo-based application supporting sharing of healthy living information help distributed families/friends to be more aware of each other's health status ?

Since researchers have seen promise in providing ways for people to share health information within social groups (e.g., families) to motivate conversations around health [12, 33], we wanted to

examine how reciprocal sharing of healthy living information can impact one's awareness of the other's health status. We expected that mutual sharing of healthy living information could bring opportunity to enhance distributed families'/friends' interactions around health.

RQ2b. How can a lightweight photo-based application supporting sharing of healthy living information facilitate collaboration around health within distributed families/friends ?

We were interested to examine whether reciprocal sharing of healthy living information may promote collaborative interactions on healthy behaviors within distributed families/friends. We expected that the reciprocal mechanism in which each person is sharing and supporting the other to become more active could foster effective social (e.g., families) involvement on health.

To answer these questions, we deployed the application in a 7-day field study as a probe of technical intervention to understand how family members and friends used the application in their natural settings and test the application under realistic conditions [18]. We used semi-structured interviews and application log data to explore how sets of participants used the application and engaged with their family members and friends. The specific contributions of our research are:

- An understanding of how a photo-based application can be used to facilitate healthy behaviors among distributed individuals in their everyday lives, especially when facing adverse events;
- Our study sheds light on the importance of increased awareness to allow individuals to observe others' actions and apply them to their own behaviors and beliefs accordingly. Also, our results offer important insights into promoting effective support over distance and its benefits to encourage people to keep engaging in healthy practices collectively while facing a difficult time;
- Based on our findings, we discuss potential strategies for designing interventions that engage individuals in healthy behaviors while living apart.

2 BACKGROUND AND MOTIVATION

2.1 Technologies for Health Promotion

Prior works in HCI research have examined and developed technological tools to support people on adopting healthier behaviors by empowering individuals to increase control over and to improve their health according to their everyday behaviors [26]. For example, Fish'n' Steps [44] used novel visualizations by applying familiar metaphors to represent physical activity data and encourage those behaviors and Crumbs [28] used food journaling and daily challenges to promote mindful eating. Collectively, these studies showed the potential for technological interventions for health promotion and urged for further design and study on approaches that help users develop a connection with the system and social features to support engagement.

While many researchers have focused on *personal informatics* where people collect data to gain self-knowledge, there is a growing interest in going beyond the personal level to involve interpersonal relationships such as friends and families. One research opportunity for consideration in this realm is: how technology can help families and friends to pursue well-being together.

2.1.1 Technologies for Health Promotion within Families. Prior HCI researchers have explored *family informatics* [58] to examine how technologies can help families to engage in healthy behaviors together. For example, Schaeffbauer et al., [69] developed a system to help families become more aware of their snacking behaviors and Lukoff et al., [45] investigated family support practices on healthy eating. Other prior works show family interactions around physical activities such as Oygür et al., [54] investigated how families use activity trackers towards collaborative management of family health. Saksono et al., has developed both a family exergame [68] and mobile app [64]

named “Storywell” to promote opportunities for family physical activity. And Knaving and Wóznia [42] proposed an interactive tool to facilitate family communication around physical activity (i.e., running). All these studies presented important findings suggesting that technology-mediated health interventions can increase support [45] and behavioral awareness [69] within families, and that these shared experiences enable new types of family interaction around health such as friendly competition [54]. Also, these studies leveraged the benefits of families’ strong bonds and physical proximity, and sought to inform the design of health promotion systems for families. Still, there are opportunities for family informatics to further explore different family dynamics and structures [41].

One important research opportunity for consideration is: how technologies can facilitate people (e.g., families, friends) to be active collaboratively *over distance*. Research in HCI has developed platforms to support people who are apart from their loved ones (e.g., families, couples, friends) on maintaining general communication and awareness [9, 39, 78], on sharing their lives and experiences [19, 37, 50], and fostering a sense of closeness and connectedness [16, 46, 83]. While these efforts are important since they seek to better support these individuals in terms of having sustainable communication, facilitating shared lived experiences, and increased sense of closeness despite the distance, future systems need to be built considering the needs and challenges of non-collocated people according to their everyday routines and practices of healthy living.

In this work, we focus on families who live apart. Specifically, this work focuses on the family relationship between elderly parents and adult children because this family dynamic poses unique challenges; for example, as individuals age, needs for providing care and support increase, and difficulties on remote caregiving may emerge [34, 71, 72]. Prior researchers have investigated this family dynamic considering the challenges of providing support on health remotely; for example, Binda et al., [12] examined elderly parents’ and adult children’s information sharing practices and their motivations to curate what health-related information they share within their families. In addition, Panicker et al., [55] provided empirical understanding of what, why, and how older parents and adult children share or not share their experiences surrounding eating habits and meal preparation. These studies provided valuable insights on how to effectively support sharing of health information among non-collocated families members [12], and encourage family conversations around health by incorporating individual and family goals into family informatics systems [55].

We build on the design strategies from prior works to examine how health applications can be designed to support individuals in their pursuit of a healthy lifestyle as well as their desire to collaboratively promote healthy living within close relationships.

2.1.2 Technologies for Health Promotion within Friends. Many individuals have used technological tools as a resource on their healthy lifestyle. Using technology for health promotion brings benefits including accountability [51], social support [53], and increased motivation to achieve health goals [48]. For instance, Consolvo et al., [24] showed that goal-setting in persuasive technologies could be beneficial to encourage individuals in physical activity and behavior change. Furthermore, Munson & Consolvo [48] observed that sharing health information within an online community could benefit one’s health outcomes due to increased sense of peer support. Similarly, Oh et al. [53] showed that people sought health-related social support from others on online social network websites such as Facebook and emotional support was most prevalent in Facebook contexts.

However, research has presented tradeoffs on using some design strategies to promote health within friends. For example, some systems integrated health and wellness interventions into existing online social network websites such as Facebook to help friends to pursue well-being collectively. While embedding a wellness intervention in an existing social website is a viable option, individuals presented concerns on cluttering others’ newsfeeds [49] and self-presentation [51]. Although these

findings reflect people's desire to share health information with personal networks, still systems need to help people to find communication partners that meet their goals more effectively.

In this study, we also consider individuals in close friendships because according to prior studies, close friends are important source of support and good friendships contribute to one's well being [4, 79]. In addition, based on prior works [49, 53], we present a design concept that explores an online social network application to observe social interactions in health intervention. Finally, we follow the recommendation of using "custom groups" of friends and families which consists of individuals selected by the user for a particular goal, for example health-related goals or emotional support around a difficult issue [51].

2.2 Awareness and Sharing Health Information

2.2.1 Health Behavior Change and Awareness. Similar to others who utilized existing theories to enhance sociotechnical interventions and organize their understanding of human behavior [7, 44, 66, 69], we grounded our work in relevant behavioral theory to understand the science of how awareness of others motivates people when trying to help them engage in healthy behaviors.

At the individual level, we consider the Social Comparison theory which examines how individuals use others' behavior to understand what is appropriate, doable, and reasonable [30, 84]. The classic finding is that being aware of others' performance enhances our performance for straightforward tasks (e.g., the original study, Triplett, 1897, studied performance in bicycle races [84]). There are a lot of studies of how awareness facilitates collaboration in CSCW [25, 70]. Although those works are not about how awareness facilitates collaborative performance, such as health collaborations, still they provide useful understanding on how awareness influences one's behavior.

In terms of health collaboration, we considered two theories of behavior. First, we looked at the Transtheoretical Model (TTM) of behavior change. TTM posits that people do not change behaviors quickly, but through a process [60]. A key construct of TTM that is relevant to our work is environmental reevaluation (e.g., awareness of others' behavior) which is related to *processes of change*. The process of change could combine both affective and cognitive assessments of how one's presence or absent behaviors may affect his/her social environment or self-image. The *self-reassessment* could be triggered by family intervention, i.e., the family member may change their behavior due to the awareness of other family members [60]. The concept has been adopted to design intervention technology to help people promote health-related behavior. For instance, family storytelling could be seen as a form of technology-mediated reflection to influence or promote children's physical activities [66]. Wearable activity tracker could facilitate the perception of safety and social connection with caregivers [65, 66]. Food journaling and daily challenges could be used to promote mindful eating [28].

Second, we examined the Social Cognitive Theory (SCT) [6]. This theory says that one's behavior is influenced by social, environmental, and cognitive factors. Two SCT's constructs are relevant to our work: observational learning ("modeling" of behaviors) and self-efficacy. Through modeling of behaviors, individuals can observe a behavior presented by others, and then reproduce it. Self-efficacy refers to the level of a person's confidence in his or her ability to successfully perform a behavior. SCT has been used to guide behavior change interventions and promote healthy living. For instance, a mobile application could provide insights into family interactions and help members being more aware of their family's snacking behaviors [69]. Sharing health information can help families to balance important values of caring and modeling [33].

Our work adopts a lightweight photo-based application as a mediator to help distributed people to engage in conversations about health and to be aware of each other's healthy practices over distance. By characterizing some of these processes and concepts, our work will help inform the future

design of more holistic health promotion tools that support people's collaborative interactions around health over distance.

2.2.2 Sharing Healthy Living Information within Close Relationships. According to prior health researchers, sharing health information within robust relationships promotes an important source of support which positively impacts one's health outcomes and quality of life [62, 74, 75]. In HCI research, studies have leveraged the benefits of sharing health information and daily routines to help individuals on finding opportunities to show care, to encourage healthy behavior change, and to provide support to each other on health [12, 33, 45, 69]. For instance, users of "Snack Buddy" shared snack information within their family which facilitated family awareness of eating habits and prompted support for healthy eating [69]. Similarly, users of "TableChat" perceived benefits on sharing information about their meals eaten separately since this practice facilitated tangible support demonstrations within their family such as helping to purchase healthy grocery items [45]. In Li et al. [43], family members shared fitness data which triggered conversations around health and prompted members to be more aware of other's health conditions. In terms of sharing health information with friends, users of "Three Good Things" found benefits on interacting with friends around the "good things" posted [49]. Creating opportunities for individuals within close relationship such as families and friendships to share information about activities (e.g., eating habits) can facilitate members to start caring about each other's healthy practices and improve health consciousness [55].

Despite the benefits of sharing everyday behavioral data on one's awareness, it can also create concerns among individuals and tensions within relationships. In some cases, individuals may feel the need to manage an image of themselves that emphasized their identity as a healthy person not struggling [51]. In families, members may feel judged when they share information about personal behaviors [3] and some individuals might choose to *not share* their experiences due to stigma [57] or tensions in the family roles [12, 55]. For instance, Grimes et al. [33], mentioned that it is beneficial to help families to share and reflect on health activities and goals together, but shared activities can also lead to negative comparisons and competitiveness. Given that, to build systems focused on relationships such as families and friendships, researchers should consider in their design aspects such as shared values, one's existing routines and practices, and individual autonomy to support family members/friends interactions, and individual and collaborative reflection around health [33, 58, 67].

In our work, we consider close relationships (e.g., families and friends) to investigate how a design solution can facilitate distributed individuals to be *aware* of their own and other's healthy practices, and to be *engaged* in healthy living, resulting in collaboration on health via an online platform. In our proposed solution, we build on prior literature to develop a concept that supports social connectedness and awareness by promoting symmetrical sharing of information to stay in touch among distributed individuals [59, 63]. Sharing information about each other can create a sense of connection and mediate awareness cues that are often difficult to perceive across distance [10, 35]. Also, we refer to prior work to use social features in our design for increasing engagement in technology-mediated health intervention since social features have been used to increase support, accountability, and motivation through functions that allow sharing one's progress [48] and promote opportunities for peer support (e.g., motivating people to be active [23]). Finally, we were inspired by prior literature to frame health in a positive manner in the broad design of our system [5]. Accordingly, we sought to understand what can be done to strengthening an individual's health based on what is perceived to be good, and through that lens, we would look at what family members/friends living apart can do to help one another to be active and healthier, especially when facing adverse situations.

3 METHODS

3.1 Application Development

We developed a lightweight photo-based application named *PhamilySpace* to motivate individuals on *engagement* in healthy practices and increase their *awareness* of each other's healthy living, resulting in collaboration on healthy behaviors over distance. Based on prior works' indication that symmetrical sharing of information promotes a sense of being in touch and aware among distributed individuals [59, 63], we decided to encourage reciprocal sharing of health information among sets of participants. In addition, we considered prior works' findings on how social features may influence individuals' engagement in technology-mediated health intervention [23, 28] and decided to include social features such as comments and likes in our design. Finally, since prior works have shown that sharing photos may be useful to evoke conversations [11, 12, 73], social connectedness [76], and encourage reciprocity [15], we decided to adopt the existing photo sharing practice as a scaffolding feature to encourage collaboration on healthy behaviors.

We chose to focus on the dynamics of social interaction rather than convincing potential users to adopt a new technology [45, 49], i.e., to develop a solution that required minimal costs for our research team, and a gentle learning curve for most participants. We decided to implement the PhamilySpace application based on JCow¹ platform, a free social networking application. The platform has built-in some basic web application functions, e.g., log-in and user account management, that allowed us to compare the use of participants' personal account and facilitated to control the variables in the experiment.

The PhamilySpace application has three main social functions.

1) *Timeline*: This function was designed to chronologically present all user posts, photos, and comments. Timeline is a *common space* for all the family members or friends to browse the health activity from others. Our goal is to use the timeline as a way to make one's healthy behaviors salient to other users (see Figure 1 - A).

2) *Sharing Photos/Caption*: At the Sharing Photos/Caption function, the users can share photos and include a caption by clicking the camera icon and typing in the text-box, respectively. Clicking the camera icon will open the cellphone built-in camera that allows the user to take photos. A prompt message *What are you doing for you today?* was provided in the text-box to encourage the users to input the content relevant to their daily activity (see Figure 1 - B).

3) *Comments/Likes*: Users can *like* a photo and reply a message posted by the sharing photos/comments function. To leave a comment, users can click on the Comment option and a text-box would pop-up under the post. Users could write their messages using their device's keyboard, and once they were done, users would press the Enter button in their keyboards (see Figure 1 - C).

3.2 Study Design and Participant Recruitment

We conducted a field study to observe participants' practices on using the proposed application in their natural settings and test the application under realistic conditions [18]. We, then, deployed the application in a week-long field study to understand how family members and close friends used the application, to learn more about their needs and interactions, and find opportunities to improve their experiences. We decided that a field study of seven days was long enough to cover and observe daily interactions over weekdays and weekends, and the length would not be a significant barrier to recruiting the paired participants from families or cohorts. We deemed the field study as a probe of technical intervention to the participants as well as to observe the mutual interactions between the family members or close friends, which is ideal in collecting the preliminary experimental data.

¹JCow Website: <https://www.jcow.net/>

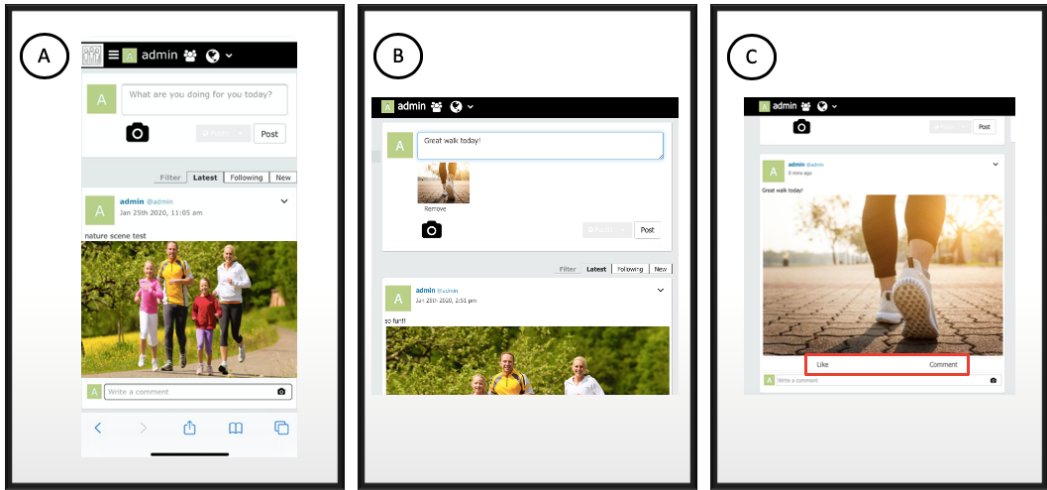


Fig. 1. PhamilySpace Functions. (A) Users can view posts as a timeline. (B) Users can post a photo. (C) Users can leave comments and likes.

The participants were paired as a group of 2 to 3 people based on the same family members or close friends. We invited each set (pair or trio) of participants to use *PhamilySpace* application for 7 days. We asked participants to post a photo daily and to check the application at least once a day. We offered to send daily reminders via email or texting. After the field study, we collected user feedback and experience data by a semi-structured interview. Upon the completion of the study, participants received financial compensation of USD\$20 Amazon Gift Card. Also, we sent all the photos and posts in a file as a souvenir for each participant.

Each participant set would have a *dedicated space* to share information, i.e., each participant set has an independent PhamilySpace instance that will not be seen or interrupted by other participants. This decision was based on prior work's results related to people's concerns with privacy while using online applications [40, 69], individuals' desire to communicate with people who know them personally instead of only their online identity [51], and as an alternative to encourage reciprocal sharing of health information, especially from older individuals, resulting in more collaborative interactions, conversations, and relationship bonding [12, 39, 55].

We recruited participants from local public spaces by distributing fliers (e.g., public library, local restaurants, university boards) and from our local university by posting recruitment requests at the university research website. We received human subjects research review board approval before our recruitment. The recruitment process has two phases.

Phase 1 Recruitment: in this phase, we focused on distributed family members, specifically the family relationship between elderly parents and adult children. To be qualified in this study, the participants should be 1) Adults (18+ yrs) living *independently and apart* from family members, e.g., one lives in a dormitory and one resides home; 2) Individuals should invite at least one older non-collocated family member (e.g., mother, father) to join the study and participate on it together, as a set of participants (2 to 3 people). Each set should have at least one adult child and an elderly parent; 3) Both individuals need to have a smartphone or computer with Internet to participate in this study. This phase started from February 9, 2020, to February 28, 2020.

Phase 2 Recruitment: Given the extraordinary circumstances of the COVID-19 pandemic, we modified the qualification of the participants. The modification was approved by the human subjects research review board. In this phase, we expanded the scope of recruiting participants for the study. To be qualified in this study, the participants should be 1) Adults (18+ yrs); 2) Individuals should invite at least one older non-collocated family member (e.g., mother, father) or **close friend** to join the study and participate on it together, as a set of participants (2 to 3 people); 3) Both individuals need to have a smartphone or computer with Internet to participate in this study. This phase started from March 26, 2020, to April, 27th 2020.

Due to the modification, for clarity, we refer to this study design before quarantine as **Study Phase 1** and during quarantine as **Study Phase 2**.

3.3 Experiment Design and Procedure

We contacted potential participants via email and shared information about the study such as eligibility criteria, study procedure, and compensation. We were concerned at the point of invitation that the request we were making was not too onerous that people would just decline. In fact, we contacted 42 potential participants and 38% (16 out of 42 people) of them declined our invitation to join the study. After the individual confirmed interest and agreed in participating, we sent the pre-survey link and invited participants to the initial meeting. During Study Phase 1, we set an in-person meeting time with the local participant and a video meeting time with the non-collocated participant. During the Study Phase 2, all training meetings happened online via Zoom.

Initial meeting & training (day 0): we presented the study goal and procedures to the participants. We explained the application is a dedicated space and that their data will not be accessible outside of the family member or close friends (i.e., other participants). We provided training to the participants on how to use the *PhamilySpace* application. We asked participants to login with the username and password provided by the researcher, take pictures for testing the camera function, post pictures with captions, and leave comments. In the end, we offered participants to send daily reminders via email or texting, set the final interview date and time, and answered any final questions. Each training session lasted around 20 minutes.

During the experiment (from day 1 to 6): participants were asked to post at least one photo per day of what they considered a healthy behavior with a short caption/description. Also, we encouraged participants to interact with the other participant by leaving comments with a message and likes in his/her posts, and post more than one photo daily if possible.

We asked all participants to comment on their experiences in sharing about their healthy lifestyles within their family or friend. Following others [38], we decided to not define “healthy living” to the participants because we wanted to let them speak about their experiences from their point of view. Especially during the social isolating time, participants spoke about how their healthy behaviors have been affected by the quarantine. We believe that not defining that term helped us to further understand participants’ experiences in natural settings as well as learn about obstacles with respect to collaboration over distance and motivation on healthy living during difficult times despite the open-mindedness of the discussion.

After the experiment (day 7): participants were invited to complete a post-survey and semi-structured, one-on-one interviews. In the interview, we explained about the interview goal and procedure, and asked permission to record the conversation. After getting the consent, the interviewer started to ask questions, such as “How do you feel about your family member’s/friend’s healthy behaviors?”, “Can you give me one example of the most interesting information you learned this week about your family member’s/friend’s healthy behavior (e.g., exercise practices, diet, etc.)?” At the end of each interview, we presented closing comments, thanked the participants for their

contribution, and sent the compensation and the photo souvenir via email. All interview sessions lasted around 30-40 minutes and were audio-recorded and transcribed.

3.4 Data Collection and Analysis

We adopted a mixed approach for the data analysis in which we used the qualitative data to explore quantitative findings [81]. The quantitative data was collected from two methods: 1) to assess participants' level of awareness, we applied surveys to collect information on individual healthiness and family member/friend awareness level before and after using the application; 2) to assess participants' engagement, we collected information from users' logging of activities such as record of number of photos shared, comments and likes. Also, social engagement between sets of participants was observed by reading participants' comments and likes to one another.

The qualitative data was collected from the one-on-one semi-structured interviews. We used an inductive, qualitative analysis where the research teams open-coded transcribed recordings of the semi-structured interviews to identify emergent themes, which were then discussed and iterated on to develop key, high-level themes. We report on themes related to application use and family/friend interaction, which primarily emerged from the semi-structured interviews with intervention group participants.

3.5 Participants Overview

A total of **26 people** participated in this study in both phases (21 females and 5 males). During this Study Phase 1, 6 family pairs/trios participated in the study with a total of *14 participants* (11 females and 3 males). For the Study Phase 1, all participant pairs/trios were immediate family members, representing intergenerational family relationships (e.g., mother and daughter). For more details, see Participant Demographics in Table 1. In the table, we refer to a set of participants as *Set ID*, i.e., S1 represents the family of the two participants *P1* & *P2*, S7 represents a group of friends of the two participants *P15* & *P16*, etc.

Table 1. Sample demographics from Study Phase 1.

Set ID	Participant ID	Relationship	Age
S1	P1	Daughter	19
	P2	Father	54
S2	P3	Daughter	26
	P4	Mother	59
S3	P5	Daughter	21
	P6	Son	19
	P7	Mother	48
S4	P8	Daughter	22
	P9	Mother	56
S5	P10	Daughter	30
	P11	Father	54
S6	P12	Daughter	20
	P13	Mother	58
	P14	Daughter	23

3.5.1 Participants Overview for the Study Phase 1. During the study phase 1, **6 older adults** (4 females and 2 males) participated as representatives of the “elderly parents” generation. The median

Table 2. Sample demographics from Study Phase 2.

Set ID	Participant ID	Relationship	Age
S7	P15	Friend	26
	P16	Friend	27
S8	P17	Friend	30
	P18	Friend	30
S9	P19	Friend	19
	P20	Friend	19
S10	P21	Boyfriend	19
	P22	Girlfriend	20
S11	P23	Brother	24
	P24	Sister	22
S12	P25	Niece	18
	P26	Aunt	55

age of older adults was 55 years old ($n=6$). All older adult participants self-identified as White-American. Most older adult participants in this group self-reported their highest level of education as bachelor's degree or less ($n=4$) or master's degree ($n=2$). Some participants ($n=4$) reported feeling confident using technology (e.g., mobile apps) and some ($n=3$) reported often sharing photos or videos on social media platforms (e.g., Facebook).

Also, **8 young adults** (7 females and 1 male) participated as representatives of the “adult children” generation. The median age range of young adults was 21.5 years old ($n=8$). All young adult participants self-identified as White-American ($n=8$). Most young participants in this group self-reported their highest level of education as bachelor's degree or less ($n=6$) or master's degree ($n=2$). All participants ($n=8$) reported feeling confident using technology (e.g., mobile apps) and some ($n=6$) reported often sharing photos or videos on social media platforms (e.g., Facebook).

For the Study Phase 1, all participants lived in the United States. In terms of living conditions and geographic distance from immediate family, both young and older adult participants lived independently and presented different variations, ranging from living across towns to living across the country (e.g., West Virginia, Georgia [U.S. state]).

3.5.2 Participants Overview for the Study Phase 2. During the Study Phase 2, 6 pairs of friends participated in the study with a total of **12 participants** (10 females and 2 males). All participant pairs defined their friendship as close and longer than 5 years. For this the Study Phase 2, we did not differentiate individuals' generations since we were not considering the intergenerational family relationship variable in this phase, instead we considered people's relationship broadly (e.g., friendships). For more demographics details, see Participant Demographics in Table 2.

For the Study Phase 2, the median age range of participants was 21.5 years old ($n=12$). Most participants self-identified as White-American ($n=7$), three self-identified as Latinx, and two self-identified as African-American. All participants in this group self-reported their highest level of education as bachelor's degree or less ($n=12$). Most participants ($n=11$) reported feeling confident using technology (e.g., mobile apps) and some ($n=8$) reported often sharing photos or videos on social media platforms (e.g., Facebook).

For the Study Phase 2, all participants lived in the United States. In terms of living conditions and geographic distance from friends, participants lived independently and presented different variations, ranging from living across towns to living across the country (e.g., Alabama, New York State). One pair of participants were siblings, one pair of participants self-reported on being in

a hetero romantic relationship (i.e., boyfriend and girlfriend), and one pair of participants were extended family members (i.e., niece and aunt).

4 FINDINGS

We present our field deployment results in terms of overall PhamilySpace usage and our three main themes related to participants' interactions and awareness on healthy behaviors.

4.1 Overall Application Usage

Participants used the application consistently during the study period. Over the week, we noticed the sets of participants using *PhamilySpace* everyday – a total of 86 comments ($AVG = 14.3$; $SD=12$), 164 posts ($AVG = 27.3$; $SD=5.2$), and 71 likes ($AVG = 11.8$; $SD=8.5$) per set of participants during the Study Phase 1 and a total of 64 comments ($AVG = 10.6$; $SD=6.8$), 112 posts ($AVG = 18.6$; $SD=2.3$), and 66 likes ($AVG = 11$; $SD=4.2$) per set of participants during the Study Phase 2. Figure 2 and 3 shows the count of comments, posts and likes per set of participants in each phase.

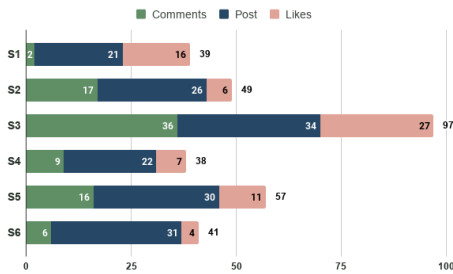


Fig. 2. Application Interactions per set of participants - Study Phase 1

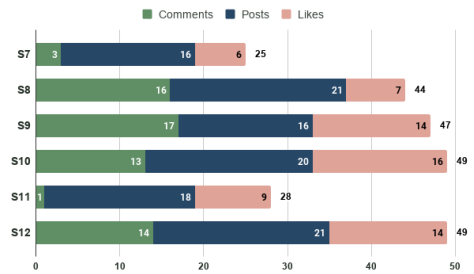


Fig. 3. Application Interactions per set of participants - Study Phase 2

As shown at Figure 4 and 5, in half of the groups ($n=3$ in each phase), there was a small decrease in number of posts/comments by the end of the week which maybe due to the “Novelty Factor” wearing off and the effects of reminders also wearing off over time despite the short intervention time [8, 31]. Some reasons for less engagement included: “It was a really busy week (P4); “I don’t usually post pictures so I had to go out of my way to take a picture of something considered healthy.” (P7) and “I am studying and trying to keep up with schoolwork.” (P20)

We asked participants **in both phases** their opinion about the PhamilySpace interface and functions. 54% (14 out of 26) of participants **in both phases** agreed or strongly agreed that *PhamilySpace* was easy to use, and 42% (11 out of 26) agreed or strongly agreed that *PhamilySpace* was intuitive. 46% (12 out of 26) of participants in both phases agreed or strongly agreed that using the app made them feel happy. Most of participants ($n=24$) presented positive attitude and thoughts about the application interface and functions such as the Comments and Like functions: “I liked commenting in all of my family’s posts. It was fun. It was nice to be encouraging I guess.” (P5)

Participants **in both phases** remarked the benefits of having a dedicated space for close relationships to share information: “I like the fact that it can be a smaller group than what we normally do with social media. And you can support a group of people that aren’t charging or just trying to get information but trying to support each other.” (P8) And the benefits of an application focusing on healthy living: “I really liked it. I could see people using this because, on more general social media, that’s not a specific, tailored purpose. You kind of see a whole bunch of things, but this app [PhamilySpace] is nice because it encourages you to post about ‘how am I doing?’. And I like seeing

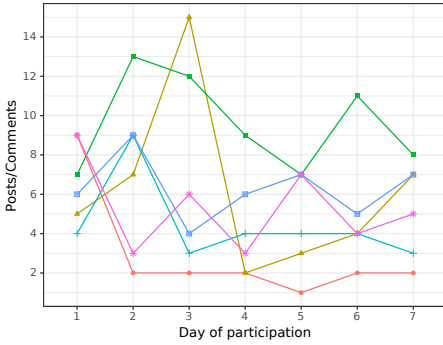


Fig. 4. Application Usage - Study Phase 1

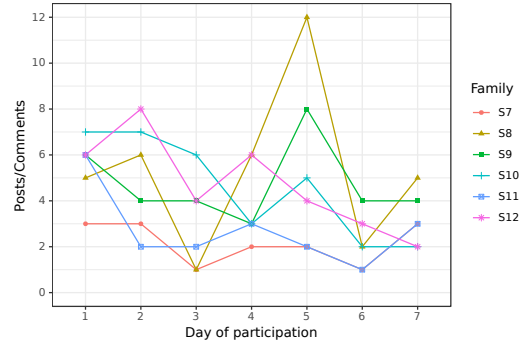


Fig. 5. Application Usage - Study Phase 2

how they [family] think, their perception of healthy activities and seeing what they do differently.” (P12)

Participants agreed that the application use helped them think more about their and their family/friends’ behaviors: “Overall, it definitely helped me become more aware of what I’m doing, but also what my dad is doing. It made me not feel pressured to do things but to think how can I do something healthy today, so I’ll be able to post it. And so that my dad will be able to see it.” (P1)

And they explained how the application usage increased their interactions around health-related topics. For example, participant P10 said that an application focusing on health would support her resolution of having a “year of health”: “I mean, I really enjoyed having a concentrated purpose of communicating with my dad just above and beyond the day to day texting that I was doing with him and the family. It’s my year of health. I’m glad that there is a platform among a variety of platforms out there to support it. And I think it did help my dad and I talk more concretely about our health.” (P10) And participant P11 echoed his daughter’s (P10) thinking and impression on using the application: “I thought that it increased the interaction between me and my daughter, specifically as it relates to healthy living. I did go in each day, probably a couple of times a day, checked on things and I posted every day. I found it to be a good experience.” (P11)

Study Phase 2: specifically in this phase, participants’ comments on increased interaction around health-topics was more vivid because participants were facing the quarantine time: “I thought it was a really nice distraction for this current time. I think it made me engage on healthier behaviors. And I just really enjoyed seeing what my friend was doing during her day. And it kind of gave an excuse for us to share more healthy things.” (P18)

Similarly, participant P22 explained how the app usage prompted her to be active during quarantine: “I think this week, it kind of gave me like a reason to make sure that I am doing healthy things every day, because it’s really easy to do nothing when you’re stuck at home all the time.” (P22)

4.2 Family/Friends Interactions and Engagement

Initially, we designed *PhamilySpace* to engage distributed family as a unit in moving towards collaboration on healthy living. Later, this idea was expanded to include other relationships such as friendships. Participants **in both phases** described how the application use facilitated interactions and engagement around health-related topics. These findings highlight the importance of bringing together close relationships to promote healthy living and suggest that the proposed application engaged the family/friends in meaningful ways. Here we describe the ways that family

members/friends engaged with each other during the study and how the application played a role in those interactions.

4.2.1 Perception of Healthy Behaviors While Using PhamilySpace. During this study, participants were asked to share photos representing what they considered a “healthy behavior” with a family member or friend. Participants **in both phases** commented that using the application made them think more about healthy behaviors in their daily routine which motivated them on taking action towards healthy practices. In both study phases, 40.5% (112 out of 276) of the posts were related to eating habits and physical activities. Some reasons for posting about food and exercise were “*food is a big part of our life*” (P3) and “*to be active typically involves some kind of workout.*” (P8)

However, as they used the application throughout the week, participants seemed to change their perceptions of what a healthy behavior is, going beyond the more visible and straightforward practices such as food and exercise. One reason for the change of perception was: participants were *intentionally thinking* about their behaviors.

Study Phase 1: at this phase, we present one example on how deliberate thinking expanded participants’ perceptions of healthy behaviors. Participant P5 said that during the intervention she had the chance to think more about what she is doing during her day: “*I think for me at least made me think more about what healthy things I am doing. I think it actually help me to be more motivated to find something about my day.*” (P5) According to participant P5, at the beginning of the week, she was planning for healthy activities that she could do. But during the weekend, it was hard to distinguish her healthy behaviors: “*I knew I wasn’t really doing anything on Saturday. And so I was definitely thinking ‘Okay, what can I do today that is healthy?’ Kind of seeking for something.*” (P5) She then decided to clean her house and post about it as representation of a healthy practice: “*I was mopping the floors and vacuuming, basically cleaning the entire apartment that day. I was like, ‘this is a lot of work.’*” (P5)

As result of intentionally thinking on their behaviors, participants started to notice their mundane practices more and were able to identify “**ordinary acts of health**” within their routine. Participants, then, referred to the concept of “ordinary acts of health” to describe activities that usually would not be the obvious choice for a healthy practice because those practices are a *common* part of their routine.

According to the participants in the Study Phase 1, examples of ordinary acts of health were “doing pottery” (P3), “sunbathing outdoors” (P4), “drinking a gallon of water” (P6), “making her bed” (P10), “journaling and brushing teeth” (P13). See figure 6 as example.

Study Phase 2: during this phase, participants were also intentionally thinking about their behaviors during their day, such as participant P16 mentioned how actively thinking about what she was doing during her day helped her to expand her thinking of healthy living: “*I was actively think about what I was doing in the day that would be beneficial to me that wasn’t just about diet and exercise but it could be broader like mental health, emotional health. And I really appreciated it, because all of those things are how we take care of ourselves. So, it was helpful to me to think beyond maybe what I would normally think about.*” (P16)

Again, we observed the same idea of “ordinary acts of health” emerging among participants who were facing quarantine time (see figure 7 as example). However, in this case, participants added two layers on top of the ordinary acts of health concept.

For the participants in quarantine, “ordinary acts of health” referred to: (1) activities that *contributed to their emotional and mental wellness* and (2) activities that were *accessible* to them during the quarantine.



Fig. 6. Example of Ordinary Acts of Health - Study Phase 1



Fig. 7. Example of Ordinary Acts of Health - Study Phase 2

First, in terms of practices that *benefit their emotional and mental wellness*, participants mentioned “taking breaks between online classes” (P20) and “family zoom meeting” (P26) as practical examples of ordinary acts of health during quarantine.

Participant P22 considered that her posts showing herself taking care of her plants was an act of health: *“I think that’s healthy and a way of taking care of my mental well-being. Plants really mean a lot to me and, taking the time to be with my plants and water them, it just makes me feel better and healthier mentally at least.”* (P22)

In addition, participant P26 commented on how cooking and baking have been relaxing activities for her during quarantine: *“I cooked and baked today. I do that because it’s relaxing. It’s a hobby. As opposed to just being a couch potato or sitting around watching TV. But for me when I’m up and moving and baking and walking, it’s something I mentally enjoy.”* (P26)

Lastly, in terms of *accessible practices* during quarantine, participants gave practical examples of ordinary acts of health such as “going for walks” (P15) and “taking vitamins” (P22).

For instance, participant P23 described how mowing the grass gave him a sense of control and accomplishment on doing physical activity since he is not able to go to the gym anymore: *“So, I felt that I got a work done. I was like, ‘wow! that was actually pretty intense.’ I just kind of admire a job well done.”* (P23)

4.2.2 Family/Friends’ Awareness on Acts of Health. Family/friends’ awareness was an important concept in this study since we wanted to examine whether a photo-based application supporting sharing of healthy living information within distributed families/friends would impact one’s awareness of the other’s health status. 77% (20 out of 26) of the participants **in both phases** agreed or strongly agreed to be more aware of their family member’s/friends’ healthy behaviors after using the application. The qualitative data supported this finding – participants reported feeling more aware of their family members’/friends’ healthy behaviors and suggested that the application increased their family/friend-level of health awareness. Family/friends’ awareness was not just an abstract concept that participants identified; it provided tangible benefits, such as facilitating conversations about health and provoking reflection on nuanced behaviors.

Study Phase 1: First, participants mentioned that increased awareness was useful in two ways: (1) to *bring ordinary acts of health to light* and (2) to *facilitate finding mutual interests*.

For example, in P1's and P2's case, they said that they talk a lot during the week about mundane things and both defined their relationship as close. However, during the intervention week, P2 posted a picture of his bowling league which he practices every week. When P1 saw the picture, she said she had forgotten about her dad's practice, so she took initiative to send him a text about it: *"This is certainly interesting because I'll probably call him once a week or so and we don't usually talk about that [health], he won't be like, 'Oh, I'm going to the gym today.' So it was nice to see that because I forgot he's in a league and he bowls every Tuesday. So, we talked about the bowling game."* (P1) Meanwhile, participant P2 was satisfied with the received text: *"because this gave us something else to talk about or communicate about. I mean, the bowling conversation definitely would not come up before."* (P2)

Another tangible benefit mentioned by P1 and P2 was to find a new common interest that may increase their interaction around healthy behaviors. Participant P1 mentioned that during the intervention she decided it was the perfect time to go to the gym and post about it because she has not been to the gym the entire year. Participant P2 saw the picture and said that he was happy that P1 went to the gym: *"I know she doesn't like going to the gym too much. So, I sent her a text after she went to the gym 'So you're at the gym? Good job!'"* (P2) According to P2, he has been trying to help P1 to engage in exercise for years. So, this experience gave both of them a new common topic to talk about: *"We always talk during the week, but it was good to be able to focus on something that we could possibly have in common. We may join together one day, I can help her with that [exercise]."* (P2)

Similarly, in participant P14's case, before using the application, she did not know what kind of healthy activities her mom and sister did often: *"So, I saw my mom doing meditation activities on a day to day basis. Before the app, I did not realize how often she did that. And I like seeing her [sister] out to eat with her friend. She showed that on one of the pictures."* (P14) Participant P14 commented that knowing about her mother's meditation habit could spark asking her for information that she could read about it too *"and start conversations together around health, which we haven't done a lot in the past."* (P14)

Furthermore, participant P14 mentioned that she gained greater awareness on her own mundane healthy behaviors, making them more visible: *"I don't think that using the app really changed how I act, but definitely made me more aware of the things that I was doing. So, for example, this morning, I shared a picture of what I ate and it just made me think 'oh, that is a pretty healthy choice for breakfast.' And before, I wouldn't be thinking that way or it would not just pop in my mind I would guess."* (P14) According to participant P14, being more aware of her own acts of health felt good, and more so when sharing the new found knowledge with family: *"because it is nice knowing that I was making a good choice. Also, it was more fun to share with them [family] and to see what they were doing."* (P14)

Finally, having an increased awareness provoked participants to know their family member even better which led them to *reflect on what they could do for themselves.*

For example, participant P9 said she thought she knew her daughter well but during the intervention, she noticed more of her behaviors: *"I guess I didn't realize how much she enjoys working out, because I don't remember that being the case when she was growing up."* (P9) Participant P9 described how seeing her daughter's practices motivated her: *"It's encouraging. It's nice to see what she's doing and get a good idea for what I should be doing."* (P9)

In participant P11's case, he mentioned that he usually talks about health-related topics with his daughter due to their family health history. According to participant P11, through the application, he was able to reflect more on what he could do to be healthier inspired by his daughter's posts: *"One day, she took a picture of her window from her workspace and it had flowers and it was a pretty day and she wrote: 'Just looked outside, just making sure to clear my head before I get out, walk*

around.’ Just again, I can do that as well. I’m sitting here in my office, it’s pretty day. Maybe I just need a minute to turn away from the computer and stare out the window and relax.” (P11)

Participant P3 also described how she used her mother’s posts to think about her own practices and come up with new practices: *“I know my mom pretty well, but there’s also something that I might be missing. For example, her collagen post, made me think ‘Oh yeah, I can just try putting this in an oatmeal or try it with like different recipes.’ I need to get that.” (P3)*

Study Phase 2: in this phase, participants mentioned that the increased awareness also helped them to know their family/friends even better. However, in this study phase, participants were facing an extraordinary event in which, for many, caused a change in their routine. Given that, an increased awareness was useful in two ways: (1) to *bring at-home ordinary acts of health to light* and (2) to *inspire alternative healthy practices at home*.

For instance, participant P16 said she started to notice details related to her friend’s (P15) common practices which she has not done before despite often talking about healthy living with her friend: *“I think everything she posted I kind of knew. I guess I start to thinking about the little small details. Like, this is how she [friend] cooks her eggs by looking at the photo that she put up her eggs and like she has little toppings on it.” (P16)* Participant P16 mentioned that noticing her friend’s mundane practices at home strengthened their relationship and encouraged her as well: *“Well, it allows you to talk to your friend, get close up with them. And it kind of challenge you to be healthy, so it shows a more healthier side.” (P16)*

As for her friend participant P15, she also mentioned the benefits of increased awareness on her friend’s at-home practices: *“Pictures are so much better because you get a sample. We always talk about healthy things, but then to actually see a picture of what she does. For example, the apple post, honestly, I wouldn’t even think about that there are different types of apples, but seeing the picture I said ‘Oh, she ate a red apple today versus maybe a yellow apple.’ So I think that I felt a bit more closer.” (P15)*

Participant P21 also explained how increased awareness of his girlfriend’s at-home practices (P22) helped him to identify different healthy practices in her routine and complement his view on her practices: *“We talk about eating well and being healthy a lot so this was just like another way of building on that. But it was interesting to see how our definitions of health and wellness are slightly different. Like, I wouldn’t post some of the things that she posted like watering plants. I wouldn’t consider that a healthy thing to do, but I can see why she thinks it’s a healthy thing to do.” (P21)*

Finally, participant P23 affirmed to have a close relationship with his sister (P24) but conversations around health-topics have never came up before. According to participant P23, his sister’s posts within the app inspired him on which physical activities he could do at home and moved him to action: *“My sister and I are pretty close, but we don’t really discuss our health routines. So, I got an idea of what she’s doing. I didn’t know the particular workout app that she uses. So, since this whole COVID-19 thing started, I’ve been looking for a new at home routine myself. I look into some other apps but her app kind of served as an inspiration for where else to look for the workouts and gave me motivation to actually get some exercise done.” (P23)*

As for participant P24, she also mentioned learning from her brother’s mundane practices at home during quarantine: *“My brother and I don’t usually tell each other when we’re exercising. So I guess I was learning what he was doing in his daily life that’s keeping him moving.” (P24)*

4.3 Family/Friends as Partners on Healthy Living

When this study was designed, we determined that each set of participants would have their own dedicated space for sharing information as an alternative to encourage reciprocal sharing of health information. The study data analysis showed that all participants from **both phases** had no privacy

concerns when sharing information within the application. Some reasons for the lack of concerns were: (a) the perceived low risk of the shared content: *“I think the things I shared I didn’t feel like super high risk things to share. Like they were just like normal aspects of life.”* (P2); (b) the tied connection and trust on the other party: *“family member is someone close to me so I trust them to be interested in seeing what I’m sending her.”* (P9), *“I trust her and I don’t think she will do anything with my pictures. Also none of them were like scandalous or anything. So, honestly it literally did not even cross my mind.”* (P25); and (c) the content was limited from public access: *“mostly because I know her and we have a friendship and so I wasn’t worried but if it was a public platform, I might feel differently.”* (P18).

57% (15 out of 26) of the participants **in both phases** agreed or strongly agreed that they felt closer to the family member/friend participating in this study with them after using the application while 43% (11 out of 26) of the participants were neutral or disagreed of feeling closer. Some reasons for not feeling closer included: *“We talk a lot during the week, so it was nothing out of the ordinary.”* (P1) *“We have a group text for our family members. We leave comments to each other, send each other pictures on a daily basis. So this [study] was just a more formalized application.”* (P10)

Participants **in both phases** mentioned that because they were using the application with someone they trust and had a strong connection, the intervention dynamic facilitated mutual sharing by lowering tensions related to self-disclosure of information and receiving care, thus promoting collaboration. The qualitative data showed that this experience provided tangible benefits for the participants such as sustainable accountability on personal and other’s behaviors, and deeper connection and bonding experience. We present these results in detail as follows.

4.3.1 Benefits of Family/Friends Reciprocal Sharing. Here we present the ways family members/friends benefited from reciprocal sharing practices in both study phases.

Study Phase 1: in this phase, participants mentioned that reciprocal sharing was useful: (1) to *hold them accountable for others’ behaviors* and (2) to *facilitate showing care and support to one another*.

For example, participant P8 mentioned that she has been trying to help her mother to develop healthier habits. According to participant P8, she has tried to encourage her every time she does something healthy but her family had never had a goal to engage in healthier habits together. Thus, when reflecting on the intervention experience, participant P8 said how it helped her to be accountable on her mother’s practices and continue showing care to her mother: *“She would call me during the week and tell me things that she was doing that she thought were healthy or that she did was unhealthy. So, I liked to be able to hold my mom accountable to things because I know it holds me accountable to continue with the healthy habits that I’m doing.”* (P8)

At the same time, participant P9 showed positive response to her daughter’s demonstration of care and support: *“She’s just been very supportive about living a healthy lifestyle and trying to get me to be healthier. So it was nice to see that and receive support and encouragement.”* (P9) Participant P8 concluded with hopeful remarks to continue on this positive path: *“I think this really helped shape that mindset of doing things in a positive environment. The accounting period really helped to contain her healthy habits, now she’s trying to eat a little bit healthier. We’re already trying to continue that and include the rest of our family.”* (P8)

In participant P10’s and P11’s case, they have developed the habit of “challenging” one another as a way to keep each other accountable on engaging in healthy behaviors. Participant P10 explained that she perceives this behavior as a positive way to encourage and move one to action: *“I see no downside to it. It just keeps you going. Everyone has their little health related goals. I certainly do, but it’s easy to get distracted from them. And then if you’ve got someone else sort of watching you*

and challenging you, it's motivation to stick with whatever the game plan was." (P10) During the intervention, P10 and P11 continued to demonstrate accountability by reciprocally sharing their healthy practices daily. Participant P11 mentioned how his daughter's post kept him accountable: "There was one day where I had just finished eating my cheese burger at lunch and I looked over [the app] and she had posted a picture of a plate with vegetables and I'm thinking 'I'm gonna have to step it up this evening for dinner.' " (P11)

In participant P10's view, her posts were a way to support her father in his behaviors: "I love my family and I want them to be as healthy and successful as possible. And they're really supportive and great to me. So if I can do something little to make sure that they're living the best life, I will." (P10) As for participant P11, he mentioned how his daughter's accountability has been important to support him in a healthy lifestyle: "I think accountability is a big thing because sometimes I can be lazy. So for me, I've seen the benefits of mutual sharing so we can celebrate each other's victories, but also, you can see that everyone else is working out 'Okay, maybe I should do that or drinking more water. Let's go!' " (P11)

Study Phase 2: during this phase, participants mentioned that reciprocal sharing was also useful for social accountability and demonstration of care and support. However, as we have mentioned, during the quarantine, some participants had to change their routine to adjust to a new way of life in social-isolation. Under such circumstances, participants expressed the need to *prioritize structuring out and managing their own personal practices out of a stressful situation such as quarantine.*

One strategy that participants mentioned to help them in structuring out their adjusted routine was *intentionally thinking* about their daily practices. In this case, the intentional thinking was applied on *planning to engage in healthy activities* daily according to participants' new reality, rather than observing existing practices.

For example, participant P17 mentioned how it was important to first observe and organize her own practices, so she would be able to cope during this difficult time: "For me, it was like, 'Okay, what are some things that I can do to just improve myself?' And like drinking water is one of them, moving my body is another one of them, right? I just need to be more intentional about going outside and taking a walk. And in this phase of life, I'm only able to do what I'm able to do. So, I felt it gave me a lot more grace to like, 'Oh, I took a walk and that is a healthy thing' versus 'Oh, I ran five miles.'" (P17)

Similarly, participant P21 mentioned the benefit of clearly viewing his own behaviors first, then taking action on them: "I feel I don't think about my own healthy habits in general. So even if I'm doing it, it's part of my routine, but now I'm consciously thinking. Now I can plan it out more and figure out 'how I'm doing?' and reflect on that." (P21)

Another strategy, participants mentioned that the study requirement of posting at least one photo per day helped them to *find a motive* to engage in healthy behaviors during quarantine. For example, participant P25 explained how the intervention motivated her to intentionally engage in healthy practices during the quarantine: "For me, it was motivating in a way because doing exercises is limited now. I cannot play tennis or go to the gym. But having to post a picture every day, I knew I should go on a walk every day. And if I can't, I could at least try to do something else. So, that was a good motivator." (P25)

As for participant P22, she described how using the application helped her to keep herself accountable on her own behaviors and be consistent on them while at home: "I think that it kind of encouraged me to do even just one healthy thing a day. That's not something that I would usually be really consistent on. Sometimes I'm like 'Okay, I'm gonna have a good week, I'm gonna do something healthy.' And then, some days I forget, but the app kind of helped me to keep myself accountable with that." (P22) According to participant P22, as a consequence of structuring out her practices, she was able to accomplish her goal on being active during quarantine: "This was the first week that I did

yoga every single day. And that has always been my goal. So I definitely think the app helped me keep up my healthy behaviors and be way more consistent.” (P22)

According to participants in the Study Phase 2, as they personally coped with the quarantine situation and adjusted their current routine following a challenging event, then sharing information with a friend/family seemed to deepen the social accountability experience due to an *increased sense of closeness*.

For example, participant P19 explained that because she could not see her friend face-to-face during the quarantine, the experience of sharing information about her daily healthy activities helped to increase the sense of intimacy with her friend: *“I definitely think this experience encourages support, bonding, and communicating on a deeper level on things that you don’t usually discuss, like health. I felt I had an intimate interaction, like, ‘Hey, here’s this workout I did today.’ Or ‘Oh, I didn’t drink all my water today’ It was like, ‘Oh, if I’m accountable to one person, she does care,’ because I also care about what she’s doing.”* (P19) As for participant P20’s perspective, she also mentioned how the intervention was helpful to knowing more about her friend’s status, prompting feelings of connectedness: *“Seeing what my friend was doing it gave me a bit of a better understanding what she’s doing to take care of herself because she hasn’t been as active of texting or calling. So, I’ve been worried about her. So, that definitely kind of gave me a side way of checking that she was okay. That was nice, it was helpful to feel connected to her.”* (P20)

Likewise, participant P22 explained how the intervention helped her to feel more connected and closer to participant P21 while social-distancing: *“It was nice to see him eating healthy, like the smoothie and the different soups posts, because I know, he’s not the most physically active person. I think that really helped me to see into his daily life a little bit by seeing other ways that he maintains his healthy lifestyle was good for me. That definitely made me feel closer to him.”* (P22)

4.3.2 Enhancing Family/Friends Support on Healthy Living. PhamilySpace provided participants with the ability to leave comments within the application to their family members/friends to support conversations around healthy living. As one of the features intended to support social engagement through the application, we investigated how participants used it. In total, 150 comments were sent within sets of participants during the intervention **in both phases** (see figure 2 and 3 for more details). These comments generally revolved around participants’ posts, for example, participant P8 said: *“I liked being able to comment and to receive comments on the posts. Especially when she was doing something that I didn’t know she was going to do. Like, when she was taking my dog for a walk, that was nice to go on the app and see that she was doing that. So it’s kind of fun to comment about that.”* (P8)

However, the comment and like features were not regularly utilized by participants **in both phases** in which they explained that they had established other channels of communication prior to the study such as text-messaging and phone-calls, for example, *“we normally do text at least a couple times a week”* (P2); *“most of the time we call each other to talk.”* (P15)

Still, participants described that the social engagement features within the application *amplified* giving and receiving support from one another in terms of *encouragement* on and *acknowledgement* of their healthy behaviors.

46% (12 out of 26) of the participants **in both phases** mentioned that sending general messages of encouragement to one another was a common practice within their close relationships. According to participants, the study experience gave them more opportunity to put this existing model into practice. However, by following the study context, their messages were focused on *encouraging healthy living daily*. For example, participant P13 said: *“It has always been important in our family to encourage each other. But because we don’t live together anymore, it’s fun to share the pictures with*

each other and see each other in action, trying to do better in exercise or eating habits every day.” (P13)

Study Phase 1: Due to the study’s focus on healthy living, participants described that the messages of support and encouragement had potential to spark more interactions around health within their families.

For example, participant P7 mentioned that commenting on her children’s posts was a way to acknowledge their healthy behaviors and to prompt further conversations around health: *“I don’t really see them that often so I made a comment to maybe start a conversation or just let them know that I acknowledged what they like or are doing.” (P7)*

As for participant P5, receiving those comments from her mother (P7) was meaningful and felt as a recognition of her practice: *“I feel like the most encouraging ones were when I was like cooking and the cleaning, my mom would comment like, ‘Oh, it looks tasty, looks nice’ and I was like ‘my mom is proud of me for doing this.’ It’s just nice to hear that she appreciates me doing something like that, that my mom cares about me being healthy.” (P5)*

Study Phase 2: in this phase, the exchange of messages of encouragement focused on healthy behaviors was highly valued. Participants mentioned that the messages: (1) *validated acts of health* and (2) *enhanced bonding feelings* while social-distancing.

For example, participant P19 and P20 reflected on their experience of exchanging comments within the app during quarantine. Participant P19 said she had the mindset of supporting and motivating her friend during the quarantine time, especially encouraging her on ordinary healthy practices: *“You do healthy things like ‘I took my vitamins today’ but that’s usually not encouraged. It’s just something that you feel it should be done. So, I feel like giving support saying ‘Good job, I’m glad that you had a glass of water today.’ It’s really encouraging and motivating even if it’s stuff that seems basic and routine. Then, if I do bigger things, that’s even more encouraging, you know?” (P19)*

As for participant P20, she also commented on her motivations to give encouragement to her friend: *“I think I wanted to support her and show her that what she was doing was really good for her and that she should keep doing it. And that positive feedback I think is helpful to give. And it’s good to say ‘oh, great job,’ or ‘Oh, I have a suggestion, try this stretch. I found that is really good for my upper back or things like that.’” (P20)*

Both P19 and P20 explained how they felt receiving encouragement from each other through the application. Participant P19 said: *“In one of my posts, she commented that my soup looked really good. And I was telling her about it later. And I’m probably going to share the recipe with her. So that was really nice, it was also something that bonded us a bit more.” (P19)* Meanwhile, participant P20 commented on how she felt: *“It was nice for her to say ‘Oh, that looks so delicious’ on my posts. It was a kind of positive feedback that encourages you to do that behavior again, and to post about it again. If you’re hearing that people are kind of liking what you’re posting, you’re more likely to do it again. Other than radio silence.” (P20)*

In participants P17’s and P18’s experience during the study, both mentioned how the exchange of support via comments was beneficial for their friendship during quarantine: *“If you can find friend to view, to pay attention to you, they will see it [information] and give you more like an encouragement. I think when you have someone to be accountable to you, you also want to encourage them, and to enjoy the experience you’re doing together.” (P17)* Similarly, participant P18 mentioned that the experience felt personal and interactive, increasing the sense of connectedness with her friend: *“...because the comments were addressing specific to the picture. So it was literally a comment on what I was doing or what she was doing or sharing something about our lifestyle. So, it felt more personal in having a conversation about what that picture was, even if it was just a funny comment or a question or just*

saying ‘hey, I did that too.’ I think that was the biggest point of connection, being able to talk about what we were doing.” (P18)

Both participants P17 and P18 presented practical examples on how the exchange of support contributed to deepen bonding feelings: “Well, some of the photos she posted, I’m like ‘Oh, I’m interested.’ She posted a picture of her drinking green juice. I was like ‘oh, what kind of green juice do you like? What does it do?’ So I just commented on it about something that she would appreciate it.” (P17) Similarly, participant P18 commented how her friend’s posts gave her insights on her daily routine during quarantine: “One of the days, she posted that her and her daughters decided it was a pajama day and they baked. That was really sweet. Just seeing how she was interacting with her kids and how they were experiencing time inside together.” (P18)

5 DISCUSSION

Overall, participants responded enthusiastically and had a positive experience using the *PhamilySpace* application. Participants appreciated the ability to receive feedback on their posts and to see information about other’s ordinary acts of health. According to them, the intervention provided an opportunity to reflect on their practices and expand their perceptions of healthy living.

Researchers in the HCI-field have developed both small-scale [63] and long-scale [22, 45, 69] interventions targeted on family-wide initiatives to connect families and improve households healthy behaviors. Though it is hard to extrapolate from studying these sets of participants for just one week, our results showed the potential for a photo-based online application to support a family technology-centered health intervention. More confidence on our results could be obtained by a broader study, where a more diverse sample and their communication practices could be included for examination. Further studies should allow more individuals to use the proposed design and the experiment to run at least over one week. Still, we think our findings contribute with valuable observations of family’s/friends’ interactions around health-related topics and present insights into their routines or practices which can inform future long-term investigations. In addition, this study complements prior works [12, 55] by proposing an intervention focusing on people (family and friends) who live apart and how they collectively engage in healthy behaviors over distance.

As mentioned, we referred to prior works to design our proposed solution, for instance, the use of social features [23], photo sharing practice [11, 15, 76], and reciprocal sharing [59, 63]. Based on prior studies, we decided to frame health in a positive manner rather than considering it following the disease/illness point of view [5]. We characterized the spectrum of health as one’s collective practices made up of physical, mental, and social well-being instead of considering one’s single practice of healthy living (e.g., physical activity). By following this approach, we were able to learn about individuals’ active engagement in healthy living based on their abilities and practices, and how family members/friends living apart could help one another to be active and healthier, especially when facing adverse situations.

In the following sections, we discuss benefits of and challenges with developing health interventions, along with strategies for designing future interventions for the family and other contexts.

5.1 Benefits of Interventions for Health Promotion

We identified three main benefits of interventions for health promotion according to this study context: (1) increased awareness on acts of health; (2) reciprocal sharing of health information supports social accountability over distance; and (3) positive dialogue around health enhances support on healthy living.

5.1.1 Increasing Awareness on Ordinary Acts of Health. Prior works have identified that awareness of other’s behavior is an important factor to aid when trying to help people engage in healthy

behaviors because it can trigger self-assessment and move individuals towards changes on their individual practices [60]. In family intervention, awareness also contributes to the practices of the family as a whole through modeling behaviors [6]. Family awareness allows members to observe on others' actions and decide whether to apply those practices on their own routines and beliefs [69, 70]. Accordingly, our findings showed that as individuals gained awareness on others' behavior, they were able to find common interests with those members. For example, P1 and P2 found commonalities on physical activities. This new found commonality helped family members to continue their work towards improving the family health as a whole despite being geographically distant. Furthermore, in some cases, the increased awareness helped participants to decide to adopt new practices and to expand their perceptions of healthy living, like P21's and P22's case. Although prior researchers have argued that family awareness of health behaviors is driven largely by and benefits from in-person interactions [69], this study findings corroborates with others that have sought to develop virtual spaces to support family awareness [7, 32, 68].

In addition, this study complements prior work [59] by showing that symmetrical sharing supports awareness of health behaviors over distance when this feature brought *ordinary acts of health* to light between set of participants. Healthy practices that would go unnoticed before since they are part of people's mundane routine were made *visible*, giving others the opportunity to know more nuanced information on one's practices, to reflect on them, and even decide whether to include them in their own routine. This finding presents an interesting interaction as a result of the increased awareness among sets of participants by creating an opportunity for individuals within close relationship such as families and friendships to share not only information about activities (e.g., eating habits[55], running [42]) but also common acts of health (e.g., brushing teeth, taking vitamins). Our findings provide evidence that can support future design on helping individuals to *discover mundane healthy practices*. For example, prior work [65] proposed future systems should aid *discovery moments* by having elements that simply help the users to notice moments that support relatedness such as contextual information and emotional meanings on their data. We add that future systems could help users to intentionally think about their daily behaviors. For example, designers could incorporate one's mundane practices into the system by simply probing users to answer "*Can you tell what are you doing for yourself today?*" to facilitate the discover of *ordinary acts of health* and prompt distributed individuals' (e.g., family members) interactions based on their understanding of theirs and other's regular practices.

Moreover, at this Study Phase 2, we had participants facing a challenging situation due to the COVID-19 pandemic. In our study, we noticed how individuals responded to the pandemic and applied coping strategies in their routine. Prior works have examined the different ways people may respond to adverse events and have used coping strategies, including self-awareness and communication as a way to manage the stress from the change [17, 21]. Our findings showed that individuals had the need to reassess and structure out their routine due to the changes caused by the pandemic. For example, P17 had to plan to engage in healthy activities daily according to her new reality. In addition, participants commented on the need to identify alternative healthy practices while facing the pandemic. Participants mentioned that the application helped them on coping by facilitating communication with their loved ones. In addition, our results showed how the increased awareness, especially of ones' ordinary acts of health at home, was important to reveal details of other's practices, giving opportunity for modeling behavioral change [6]. Participants mentioned that by observing other's ordinary practices, they felt inspired in finding alternative practices of healthy living at home while in quarantine. Based on that, future work could explore ways for people to continue engaging on the *ordinary acts of health* a way to minimize the effects of stress that may arise due to a challenging situation such as quarantine. Specifically, we recommend future studies to explore opportunities to support individuals on activities that contribute to their

emotional and mental wellness and that are accessible to them during the advert event. One design direction could leverage the research around sensing and adaptive interventions to make affective computing and stress management technology to help one identify stressors clearly and cope accordingly [56, 61]. For example, during an advert event, a self-tracking system could help the individual to be aware of stress-related symptoms (e.g., insomnia) and offer some strategies (e.g., meditation, relaxing activities) to manage their lives accordingly.

5.1.2 Promoting Collaboration on Health over Distance. Prior works have emphasized the importance of developing systems that support both individual and collaborative reflections around healthy practices within the family as a way to support interactions in this topic over distance [19, 55, 58, 66]. In this study, we built the *PhamilySpace* application on this understanding and examined how reciprocal interactions could better support awareness over distance. We designed the application to provide implicit information through photo-sharing to evoke conversations [11, 12, 73]. And we included social features to support user engagement, such as comments and likes [23, 28]. Similar to other family-health interventions [45], our participants seemed open to provide support on each other's efforts to pursue healthy living and receive encouragement on good behaviors. Participants mentioned tangible benefits of social support such as deeper connection and bonding experience. This finding corroborates with prior works [46, 80] on showing the importance of building technologies that support emotional connections and enhance sharing with care.

Furthermore, participants in this study mentioned that reciprocal sharing was beneficial to support accountability on their personal and other's healthy behaviors. This finding suggests that mutual sharing of health information is effective for engaging the family in behavior change [6]. Although prior research has pointed out how comparisons and competition based upon health information can be seen as negative and potentially discouraging [33], this study presented examples of how awareness of other's behaviors facilitated collaborative performance [30, 84]. Our findings showed family members cooperating as an alternative mechanism to competition. For example, the interplay between P10 and P11 showed a positive interaction on "challenging" each other on healthy practices. Both participants valued the friendly competition because both enjoyed it and also because it kept them engaged. Thus, we argue that beyond encouraging individuals to share information together [44, 49, 55], there are more opportunities to support collaborative engagement in healthy practices experiences across distance. Prior works suggest future systems to offer options for family members to choose which model of interaction they prefer (i.e., competition, cooperation, or neither) [54, 69]. Accordingly, we recommend future technologies to continue examining how to augment positive interactions to better support collaboration on health across distance. For example, a system could present options that are in accordance to one's life stage (i.e., middle or late adulthood, etc.) and healthy practices preferences (i.e., physical activity: running or walking, etc.).

Phase 2 of this study, participants were dealing with the pandemic and presented the need to prioritize their personal practices by taking the time to *intentionally think* about and plan an adjusted routine according to their new circumstance as mentioned earlier. After structuring out their practices, participants explained that sharing information with a close friend/family member seemed to deepen the sense of accountability and closeness. In our research, we observed that the shared health information was unique because it presented a sample of the individual's adjusted life at home during the pandemic.

Prior researchers have observed that sharing health information within online networks can increase the sense of peer support [48, 53] and accountability [51]. Also, while individuals are dealing with unexpected events, prior works affirm that interpersonal communication and social support are effective coping strategies that one can use during a difficult situation [17, 82]. Building

on these findings, we believe there is an opportunity to promote collaboration on health during difficult times. One potential design opportunity is to leverage existing online platforms such as Zoom² that have attempted to facilitate virtual interactions to promote communal healthy practices over distance. For example, future design can present an online system that shows information from educational programs that contains adjusted healthy practices for the current situation, such as SHAPE America³. Then, individuals can select activities based on their personal preferences of healthy practices according to their current situation. The future system should also offer sharing features within a selected group of family/friends [51]. If a person decides to practice yoga at home as a way to focus on mental and emotional wellness during the adverse time following the instructions presented at the educational program, this person could also share this plan with an accountability partner through the system and organize an online meeting where both can engage in the activity together over distance.

5.1.3 Facilitating Support on Healthy Living over Distance. Previous researchers have found that families often do not have conversations around health topics [12], yet family support is important to influence one's behavior to change [33, 58, 60]. Our findings showed that the *PhamilySpace* application facilitated support between non-located family members/friends through social engagement features (i.e., comments and likes). Although participants mentioned that sending general messages of encouragement was a common practice within their close relationships, still the study intervention gave them the opportunity to amplify giving and receiving support on healthy living, for example, the P5 and P7 interaction on leaving comments on posts as demonstration of support and care. Future work on family informatics should continue examining ways to encourage family support on health according to the needs of families with diverse structures and situations. For instance, similar to Lukoff's investigation on facilitating family support [45], we suggest future work to examine more details on which type of support (e.g., emotional, esteem, informational, etc.) non-located family members think to be more helpful to promote health collaboration. Knowing why and how a message was effective in motivating one's behavior could help individuals communicate expectations or goals with other family members/friends [48, 55].

Finally, during the Study Phase 2, we noticed that participants highly valued the support from friends/family. Participants facing the challenging situation of social-isolation commented on how the messages of support were important to validate their practices, especially the common healthy activities done at home. Also, according to the participants, exchanging messages through the application enhanced feelings of closeness and connectedness during social-isolation time despite their interactions taking place virtually. As a result, the social support encouraged participants to keep engaging on healthy practices while facing a difficult time. Our findings are in accordance to prior reports on the importance of encouragement in times of adverse events to motivate individuals on their positive behaviors and to maintain emotional health during a stressful period, especially from friends or family members [21, 82]. As for future investigations in this context, we refer back to the idea of developing technologies that aid one's mental health and wellness while facing difficulties times. One potential idea is developing a future self-tracking system to help an individual to identify stress-related symptoms that affect one's mental well-being. In addition, this self-tracking system design could present a dedicated space [39] to encourage sharing information about one's daily routine, including the stress-related information. And it could offer custom groups options [51] so individuals can choose with whom they want to share information. Finally, the design should include social features (e.g., comments) [23, 28] as a way to facilitate one's seeking for help or receiving constructive feedback. Building on these suggestions, designers would create a system

²Zoom: <https://zoom.us>

³SHAPE America: <https://www.shapeamerica.org/covid19-resources.aspx>

that provides people needing of emotional support a place to share experiences, discuss coping strategies, and receive encouragement.

5.2 Challenges on Interventions for Health Promotion

When *PhamilySpace* was designed, we wanted to propose specific features to support engagement and awareness on health when individuals are living apart. Although participants engaged with the application satisfactory, still difficulties emerged during the study intervention. Here we discuss two main challenges related to this study: (1) sustaining participants' engagement and (2) engaging different relationship dynamics, including who are different ages, gender, and have differing structures.

5.2.1 Sustaining Users' Engagement. Although this study intervention was short-term, still we observed a decrease on the application use among participants. Keeping users engaged throughout an intervention has been reported in other studies [8, 28, 31] and questions on how to overcome novelty effects still exists. In our study, we see this challenge not as a "flaw" but instead as an opportunity to think of these sorts of deployments as one-off clarifying events for long-term investigations. Our short-term study allowed us to observe family/friends interactions and learn more about intra-family dynamics which are not often seen in family informatics papers. Yet, we think sequences of *PhamilySpace* should consider using this application in long-term interventions to observe sustainable changes in individuals' routines or practices over time.

In this study, participants mentioned different reasons for the lack of engagement in the application use which can inform the future iterations of *PhamilySpace*. For example, some said facing a busy schedule while others mentioned challenges of having to post a picture everyday since this practice required them to deviate from their routine practices. Future work should consider alternatives that better suit one's lifestyle when using an application. For instance, a system could offer different levels of difficulty to match events or schedules in a person's life, or even have the option to pause using the application for a period of time which might help keep a person engaged [27, 47]. A similar approach can be used to engage users into new practices, such as taking pictures everyday. Design could frame the experience as positive and satisfying maybe by offering the option of reducing some properties of the intervention (e.g., frequency, repetition) or including personalized activities (e.g., crafting, writing stories) that empower users to manage their practices in a way that is in accordance to their values [13].

5.2.2 Engaging Different Relationship Dynamics and Structures. In this study, we observed different relationship dynamics varying from intergenerational immediate and extended family members (e.g., father and daughter, aunt and niece) to friendships. All sets of participants reported having a close and strong relationship, with continuous communication through different platforms such phone calls and texting despite living distant. Given that, tensions and relational conflicts which may be present within close relationships (e.g., family) were minimized [1, 2, 77]. And participants presented positive attitude towards sharing information within the application, with no privacy [40, 49] or self-presentation concerns [51] during the intervention experience. However, this study faced the challenge on engaging different relationship dynamics, including who are different ages (e.g., adults 60+ yrs), gender (e.g., males), and have differing structures (e.g., single parent, childless family).

We, thus, argue that there is an opportunity to design and evaluate sequences of *PhamilySpace* that engages diverse relationship dynamics and structures, such as people facing adverse relational interactions with family [1, 2, 77] or friends [49, 51]. For example, a future iteration of *PhamilySpace* may support interactions within family members with low-level of closeness and topic avoidance issues by presenting suggestions about what to share to spark communication [16] or by providing

elements that aggregate individuals' activities as a shared experience to promote feelings of closeness [19].

6 LIMITATIONS AND FUTURE WORK

Throughout this project, we tried our best to recruit participants from different groups to understand the reasons and meanings behind some experiences. However, our sample size and group of participants might not be representative of the general population of distributed families, as the majority of them were female, white, self-reported as being relatively healthy, highly educated, and experienced in using technologies. Although our study sample complies with the nature of this research and its focus on identifying underlying ideas about the topic [14], we are aware that a more diverse sample including participants with lower socioeconomic status and more ethnic variation would be needed to represent the general population of distributed families. In future work, we hope to see studies addressing this limitation.

Also, we are aware of the limitations introduced by our short study period and the preliminary nature of the results. Our study and application development was informed by prior literature and complied with the nature of field study [18]. Additionally, our research was formative and focused on (a) understanding distributed families'/friends' challenging situation to cultivate health collectively, (b) observing how family members/friends used the application in their natural settings, and (c) examining the family/friends interactions surrounding the application over time. Still, we think a long-term investigation would be useful to understand sustainable effects of this intervention in families/friends interactions and to identify potential insights from the study that may take a while to be discovered. Future work should consider using this study model in a longitudinal approach to observe people's changes in routine and practices over a long period of time.

Finally, this work focused on distributed family members, specifically elderly parents and adult children but we acknowledge the need for future investigations to consider other types of family dynamics (e.g., couples living together, children with divorced parents). Thus, we note that future work should collect a broader and diverse set of data to better understand other family dynamics in similar condition and propose innovative family-centered health interventions.

7 CONCLUSION

In this work, we used a photo-based application, PhamilySpace, to explore the potential of technology-centered health interventions to promote engagement in healthy living. From our mixed approach on the data analysis, we found that photo-based applications have potential to increase individuals' awareness on their and other's ordinary acts of health. This awareness inspired people to reflect on their behaviors, moving them to change their own behaviors accordingly. Increased awareness also aided people to find common interests and expand their perceptions of healthy living as a way to continue their work towards improved health. In addition, we observed that distributed families/friends thought reciprocal sharing was beneficial to support accountability on their personal and other's healthy behaviors. Conversations through messages exchanged within the app enhanced one's feelings of closeness and connectedness. Based on our findings, we discuss the potential of these lightweight health interventions, propose strategies for future investigations, and urge further design and study of such approaches intended to facilitate collaboration on healthy living over distance.

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