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Grandparent-Grandchild Virtual Communication Study

A Thesis
Presented to
The Faculty and the Honors Program
Of the University of San Diego

By
Tanya Keval
Computer Science
2021

Abstract

The cross generational bond between a grandparent and grandchild is extremely important. The stories, traditions, and beliefs that grandparents share with their grandchildren have the ability to shape their grandchildren's beliefs. For grandparents, the role of being a grandparent and creating shared memories with their grandchildren leaves a positive impact on their mental health. Although the elderly population prefers to connect with others in-person, including their grandchildren, this face-to-face connection is not always possible due to schedules, distance, or health. Many products have been designed for grandparents and grandchildren to try to fill this communication gap when they are apart. However, these products are often targeted towards a narrow age group with limited support for all ages to create memories and sustain their relationship virtually. As a first step to address this gap, I investigate the way grandparents interact with their grandchildren and how distance, as well as non-in-person communication, impacts their relationship through a semi-structured interview study. My findings revealed four significant themes about what grandparents value within the grandparent-grandchild relationship, how those themes are partially integrated in devices created for grandparents and grandchildren, and how this relationship can be facilitated thoroughly through technology.

Introduction

The connection between a grandparent and their grandchild is extremely influential for both parties. The stories, traditions, and beliefs grandparents share with their grandchildren greatly impact how their grandchildren view the world (Wiscott & Kopera-Frye, 2000). For some grandparents, this relationship allows them to make up what they lacked as a parent. A loss of this relationship, however, has proven to have negative effects on those grandparents. In a study by Drew and Silverstein (2007) on the psychological effects on grandparents after loss of contact with their grandchildren, they found that most grandparents experienced depressive symptoms, especially if that loss of contact was sudden. Thus, the relationship between grandparents and their grandchildren is extremely important and complex. There were many reasons for this loss of contact including divorce, family issues, distance, death, and illness (Drew & Silverstein, 2007). In particular, distance limits how often grandparents and grandchildren can see each other and make connections in-person. Past research on how this relationship can be facilitated online focuses on how elderly people communicate with others and technology already developed for grandparents and grandchildren of a certain age. Therefore, my goal is to provide an understanding of the value and meaning within the grandparent-grandchild relationship and ultimately, design a technology to support the grandparent-grandchild relationship that matures as the relationship matures.

Related Work

Elderly Communication Preferences

The most common way to communicate with others is face-to-face, however, with distance that is not always possible. The emergence of new technology has led to an expansion in the possible ways to communicate with someone such as being able to call, text, email, and video

chat. While we have ample flexibility to keep in touch with those who are not physically near us, that does not mean technology is everyone's preferred way to connect with others. Each generation has different preferences with how they communicate, and we will explore the preferences of the elderly below.

Regarding the elderly's preference in communication, one study found they prefer in-person communication to any other type of communication (Yuan et al., 2016). Second to that is either using a phone to call, text, or via video chatting. This wide array of preferences is mostly due to the person's ability, access to technology, and friends/family's access to technology (Yuan et al., 2016). Grandparents, though, lean toward video conferencing if unable to visit in-person with their grandchildren because they want to see their grandchildren as they are growing up (Forghani & Neustaedter, 2014). Despite grandparents being partial to video chatting with their grandkids, the issues that come with this form of communication are accessibility and attentiveness. Not all grandparents know how to use video chatting applications due to technological challenges, disabilities, or skepticism (Yuan et al., 2016). Thus, at times, grandparents require a third-party person such as their own child to initiate the video call between them and their grandchild (Forghani & Neustaedter, 2014). As for the grandchildren, studies have shown that younger grandchildren (under 7 years old) have a hard time paying attention during video chats (Yuan et al., 2016; Forghani et al., 2013; Ames et al., 2010). For example, in one study on the benefits of video chatting for families, researchers found that grandparents geographically distanced from their grandkids enjoyed watching their grandkids grow up when using Skype, but parents were needed to control their younger kids who were interrupting or no longer engaged in the calls (Ames et al., 2010). Therefore, videoconferencing

is not effective for all groups of grandchildren and cannot support the entirety of the grandparent-grandchild relationship.

Technology Currently Supporting the Grandparent-Grandchild Relationship

In the past ten years, there have been a variety of technologies created to facilitate the connection between grandparents and their grandchildren. Those technologies tend to fall into one of three categories: reading/storytelling tools, social media platforms, and video chatting applications. We will explore each category in greater depth and discuss the limitations with the targeted demographic.

Because younger grandchildren, in particular, have difficulties paying attention for long periods of time but are intrigued by action and adventure from stories, devices have been developed to allow grandparents to be part of story time remotely (Vutborg et al., 2010). Namely, Family Story Play and Story Play, the eBook version, are two devices of this kind (Raffle et al., 2010; Raffle et al., 2011). This digital story time fosters an environment for grandparents to play a critical role in their grandchild's academic development. The demographic of grandchildren these devices target are the younger ones, specifically ages 2 - 5, since that is the age range where children start learning how to read. Though the reading comprehension elements built into the devices are interactive, they do not inspire conversations beyond the reading material for children to interact with their grandparents. Thus, these devices are effective for a short duration of the grandparent-grandchild relationship and do not facilitate any conversation beyond the activity.

Devices designed for older grandchildren take a social media approach due to their generation being so accustomed to easily sharing big moments in their lives, photos, and status updates online (Lee et al., 2015). The social media platform Hi Grandpa! consists of two

different devices, one tailored to grandparents and the other created for older grandchildren. Grandchildren would use their Hi Grandpa! app to create social media posts in the form of newspapers and grandparents would use their device to view the newspaper and reply (Lee et al., 2015). The goal is to encourage overseas Asian students to share their life updates on a social network with their grandparents in an intuitive way. A different social media application tested with American families is called Mimo (Heshmat et al., 2017). Mimo is an asynchronous media sharing application that allows family members to capture and share memories. The memories or artifacts saved using the application can be categorized based on occasion or year which allows people to easily reminisce any time (Heshmat et al., 2017). Researchers found that participants enjoyed being able to send audio/video messages to their family members but would not recommend the application to older family members such as parents/grandparents due to a large learning curve (Heshmat et al., 2017). Although both of these applications promote saving and sharing important memories through audio, video, pictures, and text, younger grandchildren would not be able to use these systems due to their complicated nature. Also, these social media applications are missing key elements, such as embedded video chatting capabilities, to allow users, like grandparents and grandchildren, to create new memories in addition to sharing and saving.

There have been a few video conferencing solutions designed for distanced families to connect. One of the lesser-known devices is Family Portals, an always-on video conferencing application. The point is for families who are connected through the platform to always have a way to check in with one another without setting up a new connection each time (Judge et al., 2011). While this device promotes an incredible amount of contact between distant relatives, the camera-on policy was a deterrent at times for users because there was no easy way to decline

talking to other family members if the user walks into the space containing the device (Judge et al., 2011). Contrary to the physical space recorded using Family Portals, Video Play utilizes more of a virtual space for kids and distant adults to engage not only in conversation, but also through online activities such as reading interactive books and games (Follmer, Raffle, Go, Ballagas, & Ishii, 2010). The books incorporate the names of the family members chatting, further increasing engagement with the book contents, and the games have a physical aspect included where players are asked to find objects in their house and then present them to each other (Follmer et al., 2010). While Video Play does include many great activities for distant relatives and kids to do together and create memories, there is no easy way to revisit those memories or record them. We place great emotional and personal attachment in certain items and revisiting them sparks those memories (Tsai & Hoven, 2018). Without a way to save virtual memories, grandparents and grandchildren are not given the opportunity to form attachments to their special interactions online or relive those moments.

Virtual Possessions

Virtual memories are saved in the form of “virtual possessions,” or materials/valuables collected electronically. These include digital photos, social media posts, eBooks, and text messages (Odom et al., 2010). One study on attachments to physical and digital mementos found that the participants did not recognize immediately what digital mementos they had, but after further probing realized they had quite a few including photos, videos, and email chains (Petrelli & Whittaker, 2010). Those who did not have saved digital memories wished they had recorded special events (Petrelli & Whittaker, 2010). This is because people become attached to things, both physical and virtual, that encapsulate memories of relationships and events (Gennip et al., 2015). In general, these items have the ability to cue valuable memories or events associated

when revisiting them (Gennip et al., 2015). For virtual communication to be as effective as possible, it is critical that these devices allow people to create virtual possessions while connecting online in order to preserve the meaningfulness of the interactions and to allow people to revisit their virtual memories.

Research Question

There is a lot of research on how the elderly communicate and the different technologies created for grandparents and grandchildren. While those devices attempt to create a space for this intergenerational relationship to flourish virtually, there is a lack of research on what value grandparents find in these in-person and virtual interactions with their grandkids. In this study, I aim to answer the research question: *How do grandparents value their relationship with their grandchildren and how can those aspects be translated into a device?* The findings will contribute to our understanding of how grandparents and grandchildren communicate as well as how they create and save memories. This study is a first and necessary step to create a technological device that allows grandparents to interact with their grandchildren similarly to how they would in-person and gives them the ability to save their virtual memories.

Methods

Participants

Participants were recruited through flyers posted and word of mouth. In total, there were 18 participants (14 female, 4 male) in this study. They ranged between the ages of 66 and 84 years old ($M = 76$) and all were living in the US when participating in the study. One participant lives abroad, but due to COVID-19 was staying in the US with his son's family. Three married couples made up 6 of the 18 participants. The participants all come from different racial and cultural backgrounds. All participants had at least one grandchild ($M = 4$) and the

grandchildren's ages ranged between 10 months to 35 years old ($M = 15$, $SD = 6.85$). The geographical distance between the participants and their grandchildren ranged from living next door to them to living in different countries.

Design and Procedure

I conducted the study over a month-long period over Zoom to ensure safety during COVID-19. The study consisted of semi-structured interviews, meaning the questions participants were asked were based on a developed interview protocol but also included any follow-up questions pertaining to their answers. The interview was a one-on-one interview, so if two participants were married, they would both have separate interviews. The groupings of the types of questions I asked the participants were: their background, interactions with grandchildren, making/saving memories with their grandchildren, and artifacts they keep of their grandchildren. Below are examples of these types of questions:

- Can you tell me about the last time you saw your grandchildren in-person?
- Can you tell me about the last thing you saved from your grandchildren?
- How do you save the memories you make with your grandchildren?

The focal point of these questions was to understand the value grandparents find in interacting with every grandchild they have, how they interact, and how they value the memories they make with their grandchildren including what keepsakes they save to remind themselves of their grandchildren. Each interview lasted approximately 60 minutes and participants were compensated for their time with a \$25 Amazon gift card.

Materials

The interviews (both audio and video) were recorded for analysis purposes. Because of the online nature of the interviews, participants needed access to a device that ran the Zoom video conferencing application. During the interview, I asked them to share any artifacts that remind them of their grandchildren if they felt comfortable and those artifacts were screenshotted with their consent for analysis purposes. Potential examples of these types of artifacts include but are not limited to pictures, games, and knick knacks.

Analysis Process

Before doing any analysis, I took notes during and after each interview by rewatching the recordings. Each note encapsulated the main idea of a story, observation, or thought expressed by the participant and was in the form of a direct quote to ensure the original intent of what the participant said was captured. I took about 40-60 notes per participant, and overall had 979 notes.

To analyze the data, I reviewed the notes written and used affinity diagramming, a common qualitative analysis method within human-computer interaction (Sahay, 2017). The premise of an affinity diagram is to pull out general themes from the interview notes and group them together to find the participant's needs (Sahay, 2017). This is done by iteratively grouping the notes based on how they intersect and by creating a hierarchy of titles based on overlapping themes and needs. The diagram I produced uses the bottom-up, data-centered approach to understand the common themes in how grandparents interacted with their grandchildren, the value grandparents find in these interactions, what artifacts or memories grandparents keep, and how they value those memories. This is critical to understand for the findings to be helpful in the creation of a communication device for the targeted user, which in this case is a grandparent. Creating the affinity diagram was an ongoing, iterative process of grouping notes of similar

sentiment and labeling the themes as they emerged. These groupings were discussed and refined with another researcher.

Findings

My data analysis revealed four significant themes. The first theme is passing down culture and traditions. The second theme is grandparents showing their grandkids that they know them - not just about knowing facts about their grandkids but knowing what their grandkids like/dislike and why, what they might need, and what makes their grandkid feel special or happy. The third theme is grandparents getting to know their authentic grandkids. The fourth theme is the grandparents wanting to be part of their grandchild's life.

Passing Down Culture and Traditions

Ten grandparents, eight of which self-identified as first-generation immigrants and one who lives abroad, brought up their cultural roots during the interviews. They emphasized wanting their grandchildren to learn about and be immersed in the culture they grew up in. This was done through cooking cultural foods, sharing their childhood with their grandkids, and keeping the traditional names for “grandma” and “grandpa.”

Cooking Cultural Foods

When the participants spoke of cooking for their grandkids, they often named the foods they made for their grandkids. Upon further probing about why they made certain foods, participants elaborated on the fact that they were cultural foods and they wanted to share these meals with their grandkids. For example, P15 made it a point to exchange Vietnamese recipes with her granddaughter and said “... when she comes over, I will always make [recipes she sends me] and share a new recipe.” The reciprocal trading of recipes between her and her

granddaughter provided for P15 to pass down her food heritage to her granddaughter. She also brought up that one of her granddaughter's favorite Vietnamese foods is fried tofu, specifically the way she makes it. This idea of grandkids enjoying the way grandparents prepared cultural foods was also experienced by P2, P6, and P16. For instance, P16 shared that her grandson wants only her to make food for him: "[When he comes over here] I make food and sometimes his father says, 'Let's go out,' and always [my grandson] says, 'No. I'm gonna stay home and eat Ba's food.'" This is significant because for P16, her son does not eat her traditional food, but her grandson does, thus, her cooking has been integral in exposing her grandson to her culture.

Not only did the grandparents spread their culture through sharing specific cultural foods with their grandchildren, but they also cooked these foods with them. For instance, P13 explained that even though making traditional Chinese food for her grandkids allowed her to share part of the Chinese culture, the time she spent cooking those foods with her grandkids gave her the space to teach them more about their culture. She said, "We cooked, we enjoyed the good food, and we talked a little bit and I tried to teach them a little bit of the Chinese." P2 and P6 also cited cooking with their grandkids ever since they were young in order to expose their grandkids to the cultural background of the traditional food they grew up eating. So, through cooking, grandparents were able to introduce cultural foods to their grandkids and teach their grandkids about their heritage.

Immersing Grandkids in Culture

Six grandparents emphasized the importance of immersing their grandkids in their culture, first, as a teaching moment and, second, as a way to keep their culture alive. P11, P15, and P18 were able to visit their respective home countries with their grandchildren and take them to places from their childhood. P15 said her husband "... was so excited because he was able to

share with them where he was born and the country he came from.” P11 shared that she thinks after her family trip to the Philippines, her grandkids “realize how much they have over here.” Unlike these three grandparents, P2, P6, and P14 were unable to travel, but still felt it was important to teach their grandkids about the country they were from. P14 did this through FaceTime whenever he went to India: “I showed him the house and the society on FaceTime. I have a scooter there, so I show him the scooter. I told him ‘when you come, we’re gonna ride together.’” For P2, watching popular Bollywood movies gave her the chance to share her heritage with her grandkids and teach them a little bit of Hindi. She “wanted them to learn about their culture,” like these other grandparents, and wanted her grandkids to be in touch with their roots.

Traditional Names

Lastly, five grandparents specifically pointed out that they wanted their grandkids to call them their traditional names for "grandma" or "grandpa." Examples of these names included “Ba,” “Dadi,” and “Oma.” For instance, Figure 1 shows a card written by P9’s granddaughter. The card reads: “Dear Oma, Happy Birthday. I could not wish for a better Oma. I am such a better person when you are around. You make my life so much more joyful.” For P9’s family, there is a clear distinction between both sides of grandparents: my granddaughter “calls my daughter-in-law’s mom ‘grandma’ and I’m ‘Oma’ because my husband’s from Europe.” This indicates that the name grandparents are called by their grandchild are very significant. Since this is something taught at a young age, for grandparents it is important that they pass on their culture to their grandchildren once they can begin addressing their grandparents.

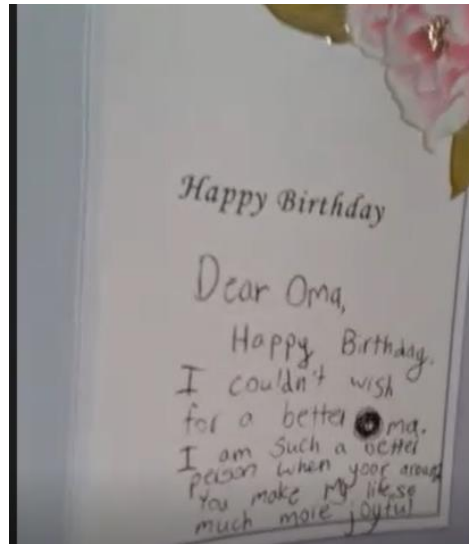


Figure 1: P9's handwritten birthday card from granddaughter.

Showing Grandkids They Know Them

The second theme is grandparents wanting to show their grandkids that they understand them. This does not mean knowing facts about grandkids, rather it is truly understanding each grandkid's authentic self and showing them that they are loved. Grandparents proved their knowledge of their grandkids through cooking or buying them their favorite things and participating in activities they know their grandchildren like.

Giving Grandkids Special Things

Participants revealed they would think about their grandchildren when they would go to the grocery store, toy stores, or the mall or if they saw something their grandkids might like. Some of these times, they would buy the product for their grandchildren and it meant a lot that the grandkids enjoyed their gifts. For example, P12 got her oldest granddaughter a weighted blanket and asked her if she still used it. When her granddaughter told her that she "loved it," P12 was excited. Eight other grandparents also shared that they bought their grandchildren gifts to show their grandchildren they are special. These gifts were tailored to the individual

grandchild. P8, for example, bought her active grandson a scooter so he could ride it in her neighborhood. P13 plans to get her grandson, who loves building, a new Lego set he keeps talking about. Grandparents giving personalized things to their grandchildren is one way for them to express that they are thinking of their grandchildren and understand their grandchildren's desires.

Cooking for Grandkids

Food was also a major way that grandparents demonstrated they knew their grandchildren. This transpired in two ways: 1) making their grandkids' favorite foods or 2) eating out at their grandkids' favorite places. Six grandparents emphasized making certain foods whenever they see their grandkids. The reactions and gratitude the grandparents received from their grandkids made them feel both appreciated and that they truly showed their grandkids they thought of them. P16 said "last time I was there, [my grandson said] 'before you leave grandma, just make it about sixty or seventy roti for me' And I did. He said, 'I'm gonna freeze it and I'm gonna eat and when I eat, I'm gonna remember you.'" P2 said that sometimes she goes to the extent of flying across the country with uncooked rice because her grandkids love the way she makes rice. She finds enjoyment in her food being consumed by her grandkids, so flying over with the rice is worth it. Through food, grandparents are able to convey they know and love their grandchildren.

In terms of going out to eat, 4 grandparents cited that they would continuously eat at certain restaurants they knew their grandkids loved. For example, P8 used to take his oldest granddaughter to Islands very often when she was little: "I used to carry her from the office up to Islands and then we'd have dinner." That restaurant not only became a tradition for his oldest granddaughter and her brother, but also with his other grandkids in LA. Similar to P8, P4 visits

the same Pizza place almost yearly. Her grandkids and her visit the lake every year because they love the water, and her granddaughter loves cheese pizza. After they are done at the lake, P8 said they “always” grab dinner at the local pizza place. These restaurants are more like traditions and because there were happy memories preserved in previous visits to them, the grandparents want to recreate those happy times with their grandkids.

Participating in Activities the Grandkids Enjoy

Grandparents also got involved in games or activities they knew their grandkids liked. Some of these activities included sports, drawing, board games, and puzzles. For example, P14 said, “Whenever I visit him in San Diego, he always likes to play with me, you know throwing balls and biking with him, scooter riding with him.” Nine other grandparents similarly participated in certain activities because their grandchildren loved the activity and wanted their grandparent to play with them too. While it is easier to do these activities in-person, some grandparents played games or were part of their grandchildren’s activities virtually. P1’s grandson lives across the country and enjoys playing video games, so his grandson downloaded a video game on his phone and they play together. P2’s granddaughter also lives across the country and she likes to create make-believe stories with barbies. They converse about the made-up stories or have virtual barbie fashion shows all over Facetime. P7 has younger grandkids, so she reads books and participates in building Legos or sculpting playdough over Zoom with her grandchildren. The Zoom calls for P7 were initially supposed to be story time, “but if we’re doing the story, she likes to have the same books, so I have to buy the same books that she has.” Though the interactions look different virtually, grandparents still put effort into doing these activities they know their grandchildren like to do.

Getting to Know the Authentic Grandkids

The third theme is grandparents wanting to get to know the authentic grandkids. While this theme is similar to the previous one (showing grandkids they know them), there is a clear distinction between the two. Getting to know the “real” grandkids really alludes to their genuine personality, behaviors, and actions that people would see every day. Having an accurate representation of the grandkids allows grandparents to create intentional interactions with their grandkids, and the only way to do this is through getting to know their authentic grandkids. Grandparents gained a true understanding of their grandkids through intentionally participating in activities with them, having grandparent time with them, and spending time with them in-person.

Participating in Their Interests

Grandparents attained insight about their grandkids’ personalities through engaging in their grandkids’ interests. Five participants spent time partaking in outdoor activities that their grandkids enjoyed including sports and scootering, while four grandparents played games or puzzles with their grandkids. For example, P4 described a “strong” memory of her and her older grandkids playing Monopoly for the first time together: “We'd leave the board out, you know, go back to it again the next day and they were like ‘You want to go to the lake? No, let's go play Monopoly.’” P4 found through playing the game that her grandkids liked the intellectual challenges that come with playing the game. Because of this experience, P4 started getting other board games for her and her grandkids to play when they come over.

With younger kids, their dislikes and likes constitute most of their personality. So, for grandparents to tap into that personality, they must engage in their grandkids’ hobbies. For example, P14 explained that sports are very important to his grandson as he loves playing

competitively and actively watches any professional sports programs. P14 noticed his grandson's love of sports and competition when he was young, so to be part of this interest, P14 described being involved in conversations about sports during grandpa-grandson walks together or watching sports games on TV with his grandson. Likewise, P4 mentioned that her grandson likes "making a cake out of playdough", which showed her his interest in creating things. Because her grandson likes to create and be active, P4 makes sure to have lots of activities for them to do together whenever he comes over. So, by engaging in the grandkids' interests, grandparents get an insight into their grandchildren's personalities and learn how to make future interactions more genuine.

Alone Time with Grandkids

Over half of the participants stated they bonded better with their grandkids when their interactions were isolated from the parents. Such interactions included grandparent-grandchildren only trips which three participants did as well as vacationing with the entire family which seven participants did. P5 takes grandparent-grandchildren trips yearly and during one of these trips, the grandkids kept sneaking into their hotel room and stealing the free chocolates from the pillows. This became an inside joke that only her, her husband, and her grandkids share. Similarly for P6, the entire family would get together at one location and on the Fridays while altogether, all of the adults would spend time together leaving her and her husband alone with the kids: "That was our time together just the grandkids and Papa and me." This was a special time for her to be able to talk to her grandkids and get to know more about their interests or life at home. Beyond learning about their grandkids' hobbies, five grandparents yearned for their grandkids to be open with them. P2 said "we talk about politics ... and all that. We are open about all the religions." She wanted to understand her grandkids' beliefs and values, explain

hers, and express to them that they can trust her even if they do not see eye-to-eye. P15 has had similar conversations as P2 with her granddaughter: “[On the phone we talk about] everything, the news, they share with me online. Like [my granddaughter] just [showed] me that she got a good deal [shopping so we have] like girl’s talk.” These more personal conversations that P2 and P15 have engaged in gave them an insight into their grandchildren’s values and interests as well as knowledge that they can get to know their grandchildren well through conversation.

In-Person Interactions

I also found that through in-person interactions, thirteen grandparents got to meet and interact with their grandkid’s true personality. For example, P1 describes his second granddaughter as very “witty” because of the many amusing stories she tells him during their dinner times. Eight other participants also indicated understanding better what things excite their grandkids and what they are currently struggling with during meals. P5 has slowly started to understand her granddaughter’s shopping personality and dress style through their many mall experiences together: “I’m the one that has taken her to buy every prom or fancy event dress because she and mom clash.” Another participant (P13), got to experience how caring her granddaughter was: “[my granddaughter] actually accompanied me to get my flu shot and she saw the other people, the old people [and] their walkers, so she was just holding me. It was very sweet.” This is one of the reasons she said she associates “kindness” and “thoughtfulness” with her granddaughters.

It is important to note that having these in-person interactions are easier when the grandchildren live near the grandparents. Half of the grandparents agreed that they spent more time with their grandchildren physically closer and less busy. While some participants like P1, P4, P6, P7, P12, P13 and P18 were able to visit their distanced grandkids a few times a year at

the least, they did not get as much time with them as they would have wanted.

Wanting to be Part of Grandkids' Lives

Grandparents wanted to be part of any aspect of their grandchildren's life. This includes passively by watching them grow up and actively by participating in their lives, as well as reminiscing through old photos.

Passively Part of Their Lives

Passively, grandparents wanted to watch their grandkids grow up. This includes watching them play at their sports games like P1, P3, and P14 (see Figure 2), or perform at their recitals like P5, P9, and P13. While it seems that grandparents would only go to their grandchildren's games or performances if they lived close to each other, that was not the case. P1 has a set of grandkids that live in the same neighborhood as him and a set that live across the country from him. While he would be able to attend more of the closer grandkids' sports games, he said, "I would do the same thing when we go to New York with [the other grandkids]." For P14, his grandchild lives on the opposite end of the state from him, but whenever he is with his grandchild, he attends all of his grandson's soccer and baseball games. These games or performances allow grandparents not only to watch their grandchildren perform at something they have been working on, but also watch them improve over time. P14 said in regards to going to his grandchild's sports games, "I think about those moments, those are fun moments to watch him from two years old to nine years old."



Figure 2: Portraits of a participant's grandchildren in their sports uniforms.

Actively Part of Their Lives

On the other hand, grandparents wanted to be actively part of the activities by playing these sports, taking their grandkids to their activities, or spending extra time with their grandkids when asked to take a more parental role. Four grandparents indicated that they would take their grandchildren to their activities and would stay to watch them. One grandparent took their grandchildren on a road trip, just grandparents and grandchildren for their ballet competition (P15). Because her grandkids had so much fun on the trip, P15 said since then, she has continued to take them alone to their out-of-state ballet competitions. P7 got to take care of her oldest granddaughter for one day a week until she graduated from high school. She noted that it was special to her that her granddaughter “still wanted to come to Grandma’s house” when she got older. P7 cherished those moments of getting to be an integral part of her granddaughter’s young life. Like P7, participants P1, P6, P8, P10, and P14 all watched their grandkids while their parents were either working or busy. Although it would seem more of a babysitting job for the grandparents, they actually got to play instrumental roles in the time that they spent and witness

the impact they had on their grandkids. For example, P10 used to watch her kindergarten grandson before and after school. During this time, P10 worked with him on his math and reading skills. Recently, she learned from his parents that the tutoring she did worked and he has improved. Overall, the time grandparents spent doing things with their grandchildren allowed them to make a direct impact on their grandkids' lives.

Milestones and Important Events

Being present during every one of their grandchildren's milestones or important events including bonding with them as soon as they were born and attending every birthday or holiday was also important to the grandparents (see Figure 3). Half of the participants agreed it was crucial they were present as soon as their grandchildren were born. I found that the time spent with the baby grandchildren allowed grandparents to really bond with their grandchildren and feel connected. P2 said that the best feeling was her granddaughter "sleeping with me, even when she was so tiny baby." P1, P4, P9, and P12 had similar sentiments where sleeping with their baby grandkids brought them joy and a feeling of closeness to their grandkids. Other important events grandparents wanted to be present during were birthdays, holidays, graduation, and going to college. P7 said that with her oldest granddaughter, there is a "tradition of going wherever she wants to go to dinner, but she chooses this Nelson's restaurant." Participants 6, 7, and 10 all either hosted or went to Thanksgiving gatherings with their entire family. For P11 and P12, their big family gatherings were during Christmas time. All of these large celebrations allowed grandparents to slowly watch their grandchildren grow up each year.



Figure 3: Family photo at granddaughter’s graduation (left), annual Easter picture of grandkids with Easter baskets (right).

Although the grandparents wanted to be there for all their grandkids’ milestones, P7 said for her distanced grandchildren “it’s just not possible, you know, to be there unless we wanted to move [up North].” She got this opportunity with her oldest granddaughter who lives near her, but she still would want to be there to see her younger grandkids. Besides P7, nine other grandparents felt the same way. They were able to be there for their grandkids closer to them more often than those farther away. Thus, distance plays a key role in grandparents fulfilling their desire to be physically present for their grandkids’ achievements.

Photos

Every participant had photos of their grandchildren around their house, on their cameras, or on their devices. Ten participants kept photos of their grandchildren in a public area of their house, either so visitors could see them or so they could see the pictures at any time (see Figure 4 for examples of photo collages kept in public areas of the house). Six grandparents kept photos

virtually either on their phone, tablet, or computers because it was the most accessible for them. P13 keeps a picture of her granddaughters as her phone's screensaver (Figure 5) "so everywhere [she] can see [them]." Seven grandparents kept pictures of their grandchildren in private areas, so only they could view those photos. Whether private or public, these pictures were placed in rooms that grandparents spent most of their time in. For example, P9 had her granddaughter's pictures in her bedroom, a room only she or her husband would go in, on her nightstand and would look at them when waking up and before going to bed. P3 preferred to keep her photos in the kitchen and living room because she is "in the kitchen and the family room [most of the time] and they're connected, so I can always see [the photos]." The pictures displayed around the house are visual reminders of them spending time with their grandkids during the various stages of their lives. P1 even said that the photos he keeps around gives him "the little sense that they're still close to me and you know, it sounds funny but I mean many times I'll just stop doing anything [and look at the photos] or when you find an excuse to show even to some strangers or friends." These photos encapsulate special moments and memories that allow grandparents to reminisce not only about their grandkids growing up, but also how they have participated in their grandchildren's lives.



Figure 4: Collages of grandchildren that grandparents kept around their house (*left*: located in a participant's dining room; *right*: located on another participant's wall).



Figure 5: Grandparent’s phone screensaver of her and her husband with her grandchildren.

Some grandparents had organized these photos into albums such as P11 who has “albums of them when they were babies to when they are grown up.” Others, like P7 and P17, kept loose photos of their grandkids in a box that they sometimes dug through. Grandparents did not just save pictures, they also saved any drawing, card, or item made by their grandchildren. For example, P10 saved all her grandchildren’s cards including “Valentine's Day card or Christmas card or even thank you cards,” P15 wears the mask (Figure 6) that her granddaughter made special for her, and P8 keeps every mug his grandkids have gotten him. The mug P8 received (Figure 7) from his grandson came as a surprise: “I was so touched that [my grandson] thought about me. You know, he thought enough about Pop Pop to get me, you know, to get me a mug when [my wife and I] didn't go [on the excursion with them].” These items are a reminder to grandparents that they have really impacted their grandchildren through their presence in their lives and it does not go unnoticed.



Figure 6: Handmade mask from grandchild.



Figure 7: The mug a grandchild got for their grandparent on a grandparent-grandchild only trip.

Social media platforms act as a virtual gallery of family photos for grandparents. Half of the participants used their social media accounts solely to look at pictures of friends, their kids, and their grandkids. Their goal was to observe what others were doing and opted to rarely post, like for special occasions such as birthdays. P7, for example, uses it to check up on her family: “my granddaughter well, she doesn't have a Facebook, but her mother does so if I ever want to find out what they're doing, I do go on Facebook and look up my daughter-in-law's account.” P4 checks Facebook occasionally to see pictures of her grandkids. P10 did admit, though, that she

misses a lot on her daughter's Instagram because she is not on Instagram a lot. Similarly, participants P4 and P5 do not log on to their social media accounts often, so they saw family posts late. Overall, social media was used quite often by grandparents to view photos or updates about their grandkids that were not discussed with them.

Discussion

Advances in technology have allowed distant grandparents and grandkids to be able to communicate with one another. Pre-existing devices and products have been designed to facilitate the interaction between grandparents and grandchildren, but they are not designed to match all the needs of grandparents. In this study, I examined what grandparents really valued in their communication with their grandchildren and how that can be translated into a device. My findings provide an understanding of the value and meaning within this grandparent-grandchild relationship that can allow us to both understand why these prior technologies have been successful in this realm and how we can support this relationship holistically through technology.

Throughout this study, several participants expressed their desire to pass on their culture and traditions to their grandchildren either through cooking or showing their grandkids how they grew up. This desire aligns with past research of grandparents handing down stories, religion, and culture (Wiscott & Kopera-Frye, 2000). Grandchildren gain a sense of themselves and develop beliefs based on what identities and experiences their grandparents have (Wiscott & Kopera-Frye, 2000). Although grandparents providing their grandkids with a strong sense of cultural heritage and family history is important, the current technology designed for grandparents and grandkids does not have explicit features for this. Implicitly, though, both commercial video conferencing applications and the always-on Family Portals device do support grandparents sharing their stories or culture with their grandkids. Support comes in the form of

how the products are utilized. For commercial video conferencing applications, virtual interactions are supposed to feel semi-in-person since the user can see all the members in their video conference (Yuan et al., 2016). Likewise, Family Portals displays video feeds from each family member's house 24/7; thus, the user can always see what everyone is doing (Judge et al., 2011). Using either of these devices, grandparents could then tell stories, share photos of their childhood, or show cultural objects they have around the house.

I also found that grandparents want their grandkids to know that they understand them, but in order to do that, they want to get to know their grandkids' authentic selves. These two ideas are actually cyclical: grandparents become familiar with their grandkids' unique persona through interacting with them, and once they know the "real" grandchildren, they can show their grandchildren they understand their needs and desires. For example, P4 spends a lot of time playing with playdough with her grandson because he loves molding it into different shapes and foods. Since they often play with playdough at his house, P4 bought her grandson more playdough for her house so they can play together whenever he comes over. Her interactions with her grandson through this activity allowed her to understand what her grandson likes to do. Therefore, she was able to get him what he wanted and can continue getting to know him by playing playdough with him.

We can see both of these themes implemented in activity-based devices and video conferencing applications. For example, the virtual reading device Family Story Play implemented an Elmo button that when pressed, sparked conversation about the book between grandparents and grandchildren (Raffle et al., 2010). This directly coincides with my findings that grandparents desire to be part of their grandkids' lives and that engagement through activity allows grandparents to understand their grandchildren. This reading device is designed for young

grandkids (under five), and for younger kids, their personality really shines through the activities they like to do. Thus, the virtual reading activity gives grandparents the opportunity to understand their grandkid's "true" personality. Video conferencing, on the other hand, is not activity-centered but provides grandparents with a way to get to know their grandkids. Grandparents can still learn by observation about what their grandkids like/dislike, what they did during their day, and show them that they care by talking about things they know their grandchildren are interested in.

Finally, it was revealed that most grandparents wanted to be part of their grandchildren's lives. This result makes sense because previous literature has shown that grandparents who do not contact their grandchildren experience depressive symptoms (Drew & Silverstein, 2007). Thus, grandparents having contact and being part of their grandkids' lives either through watching them as they grow up or doing activities with them is extremely important not only for their relationship with their grandchildren, but also for their mental health.

Social media products, like Hi Grandpa! or Facebook, give grandchildren, specifically, the space to notify their grandparents about things going on in their lives (Lee et al., 2015). Thus, grandparents can use these platforms as a means to check in and see what their grandkids are doing. Grandparents want to know what their grandkids are doing even if they could not be there because they want to be involved in their grandkids' lives. This is very similar to the passive ways grandparents participate in their grandchildren's lives. From my findings, grandparents indicated that they would go to certain venues to watch their grandkids perform live. Using video conferencing, grandparents can watch their grandkids live even if they are not in the same physical space.

As detailed above, these four themes I discovered are located across devices that have already been found to support grandparent-grandchild relationships. In more generalized devices, like commercial video conferencing, there are no explicit features to support the relationship, but the applications allow for versatility, offering the largest flexibility in support. In more specialized devices, they support certain parts of the themes, such as getting to know the grandkids through engaging in activities, but tend to limit themselves to that aspect of the relationship. By understanding the range of themes through the research I have conducted, we can now start to see how we can put together these aspects to support the whole relationship, explicitly in a device.

Putting the Findings into a Device

Incorporating the themes found above into a device can be done many different ways. The device could be standalone, a web application, or a mobile application to name a few. There are many ways to implement it, but it would require research to see what features or design grandparents really gravitate towards and find effective. That being said, some ideas for what features could be included in this device with the four themes incorporated are outlined below.

Cultural Integration

Because current technology made for grandparents and grandchildren does not include set features for the purposes of passing down culture, my first suggestion would be to add some feature(s) that gives grandparents a virtual space to share cultural stories or recipes. For instance, there could be a virtual recipe book that both grandparents and grandkids could contribute to. Traditional recipes can then be passed down by grandparents, and grandchildren can participate by adding recipes they enjoy. This cookbook supports grandchildren of all ages because with its

integration into video calls, younger grandkids can observe their grandparents cooking the recipe on the screen and older grandkids can remotely cook the same recipes with their grandparents.

Activity-Centered Device

Activities, I found, are central for grandparents to both get to know their grandchild better and show that they care about their grandchild by doing. Certain devices, like Family Story Play, only had one type of activity that was effective for a certain age range and did not always encourage conversation past the activity. Video conferencing applications allowed more conversation, but younger kids had a harder time staying engaged. To ensure the device can target any age range, my suggestion would be for the device to contain multiple multiplayer activities and games to allow grandparents the option to interact one-on-one or with multiple grandchildren. These activities or games would be integrated into the video conference, that way grandparents can talk to their grandkids while engaging in an activity with them. Examples of this dynamic activity I am proposing could be a virtual Monopoly game or virtual paint by numbers activity. For the paint by numbers activity, grandparents and grandkids would work on the same screen to color in a picture. As the grandkids grow older, the designs would be more intricate to provide a challenge no matter the age. This would allow grandparents to both participate in an activity they know their grandkids like and get to know their grandkids on a deeper level.

Capability to Save and Revisit Virtual Memories

All of the devices researched lacked the ability to both make and save virtual memories, so this very important feature could come in the form of a virtual memory box where grandparents can save virtual possessions such as video/audio recordings or messages between their grandchildren and themselves. Having these virtual memories recorded and available to

watch at any time is significant because grandparents can preserve different moments with their grandkids over time and revisit those moments to cue the fond memories associated with the virtual time spent together (Gennip et al., 2015). Part of this memory box could encompass a calendar synced with the parent's calendar, so grandparents are always aware of what activities their grandkids have going on. This is important to have because grandparents indicated that they wanted to be present during their grandkids lives. If they cannot be there in-person, then this memory box will allow them to view the pictures their children uploaded on the calendar and rewatch their grandkids growing up over time. This virtual memory box plays a similar role as the physical picture collages that the grandparents kept around their house to remember their grandkids during the many stages of their lives.

Limitations

Despite the significant findings, my work is limited by the fact that every participant interviewed had to have some experience with technology. Technology adeptness was a requirement to participate in the study due to COVID-19 safety protocols. There were some participants who had limited technological knowledge, but by far, most had used Zoom before and understood the process of joining the interview. Thus, I do not have much data from grandparents who do not use virtual methods of communication to speak to their grandchildren. It would be important in future studies to gather the perspective of less technical grandparents to understand how they communicate with their grandchildren and what value they gain from the non-virtual interaction. For the purposes of this study, though, this limitation may have had a smaller impact on the results since the overall goal is to design some sort of technology, so some interest in technology would be needed regardless.

In addition, some participants were in the presence of their kids or grandkids during the interview. This may have affected their responses to certain questions or follow-ups regarding certain grandchildren. The intended method of conducting these interviews was in-person in order to mitigate other people in the house being present and influencing answers. In the future, the interviews should be done in-person preferably at the participant's house. This would allow grandparents to feel relaxed while being asked questions and easily access or reference pictures, drawings, or items their grandkids made for them during the interview.

Conclusion

In this study, I investigated how grandparents value their experiences communicating and interacting with their grandchildren. Current technology designed to support the grandparent-grandchild relationship does allow grandparents to communicate and participate in their grandkids lives when they are distanced, but they are not built to match all the needs of grandparents. Through the semi-structured interviews I conducted, I discovered that grandparents value passing on their culture to their grandchildren, learning who their authentic grandchildren are, demonstrating they understand each grandchild's true self, and partaking in their grandchildren's lives. Based on these findings, I proposed designing a device that not only encompasses the themes described, but also evolves over time as the grandparent-grandchild relationship evolves. In this way, designers can support this grandparent/grandchild relationship holistically through technology.

Acknowledgements

First, I would like to thank Dr. Jennifer Olsen for working with me on this research project as my faculty advisor and for supporting me every step of the way. I would also like to thank Dr. Susannah Stern and Erin Fornelli for their constant support and encouragement throughout this process. I am also very grateful for the Lawrence Hinman Research Grant for funding this research. Lastly, I would like to thank my family and friends who have been there for me the entirety of my college career.

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