HelloBox: Creating Safer and Kid-friendly Communities

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ABSTRACT

Children's ability to walk to school or play around their neighborhoods without parental supervision has severely declined in the past decade. Loss of local activities and mobility may leave children unprepared for transitions to adulthood and make them less independent and may have negative health effects. In this paper, we discuss the findings of our research on children's unsupervised play in their neighborhoods. We propose HelloBox, a system including an app, wearable RFID tags, and check-in stations to keep track of children when they are outside without an adult. HelloBox lets parents know where their children are without restricting their independence and builds community between local families. The project focuses on improving children's independent mobility and encouraging social interactions between families within neighborhoods.

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	P1	*P2*	*P3*	*P4*	*P5*
M/F	F	F	M	M	M
Age	46	42	40	27	38
# of Kids	2	1	2	1	2
Kid(s) Age	10,13	11,17*	7, 4*	5	6,8
Kid(s) Gender	F,M	F,M	F,M	M	F,F
Neighborhood	Rural	Urban	Urban	Urban	Urban
Location	WA	MN	MN	MN	MN

*Did not participate in cultural probes

Table 1: Demographics of each parent participant.

INTRODUCTION

When you were a kid, did you freely roam the neighborhood with your friends? Children's ability to play without adult supervision has declined over the past decades [5]. One study of neighborhoods in Canada and London reveals reductions in *habitual activity spaces* and low levels of nearby community use. The children studied spent more than half of their off-school time indoors at home [5]. Loss of mobility may leave children unprepared for transitions to adulthood [6].

Parents may argue that overprotective parenting insulates children from risks of physical harm and victimization, yet the assault rates against children in the United States have declined 33% from 2003 to 2011 [2]. Do safer neighborhoods provide new design opportunities for increasing child-directed outdoor play? Our goal is to design a solution to facilitate child-directed outdoor play and encourage interactions between families in their communities.

RELATED WORK

Many existing market solutions use either smartphones or embodied devices to address the parents' concerns. Relay[1] and LG GizmoPal[2] are embodied devices that track children's location through GPS and allow parent-child communications. Mobile applications, such as Life360 Family Locator[3] and Find My Friends[4], give parents support for location tracking and communication. The CLIMB Platform is a European smart city project that uses cameras and traffic sensors to integrating heterogeneous data and provide up-to-date view to support the community in the management of children's mobility services. The sensors set up in schools can automatically check-in children's attendance and notify parents [3]. The Relay and LG GizmoPal are expensive for low-income family and may be difficult to use for children. Smartphones, which work with mobile applications, may also be costly. In Addition, these are exclusively GPS trackers, and there is room for more creativity, especially something emphasizes the trust between parents and children.

LIMITED PARENTAL SUPERVISION: A DOUBLE-EDGED SWORD

Parents may provide limited supervision to encourage children to function independently with a reasonable acceptance of realistic risks. The benefits of independent play have been well-researched.

[1] https://relaygo.com/

[2] https://www.lg.com/us/cell-phones/lg-VC110-Pink-gizmopal-2

[3] https://www.life360.com/family-locator/

[4] https://support.apple.com/en-us/HT201493

Figure 1: A comparison of a child's cultural probe drawing and an actual map

Child-friendly neighborhoods with parks and less traffic may help reduce childhood obesity [7] in addition to other positive impacts on children's mental health and social skills [4]. However, families experiencing poverty are less likely to live in low-crime, child-friendly neighborhoods, but they are also judged more harshly for allowing their children to be unsupervised. For parents working multiple jobs, limited parenting may not be a respected personal choice, but a necessity [1].

FORMATIVE METHODS

Our formative methods include interviews with parents and cultural probes for children. We recruited participants through word-of-mouth and flyers. We interviewed 5 parents with children of ages 5 to 13 (N = 7, See Table 1). All of our participants currently reside in the United States but share diverse backgrounds, including parents from Asia and the Middle East. One child has impaired mobility and uses a wheelchair for movement, and two children have developmental disabilities. Four of the interviews were conducted in-person at the participants' homes or offices; one interview was conducted over Skype. All participants signed consent forms and assent form for children's participation. We discussed the participants' backgrounds, perceptions of their neighborhoods, their safety concerns, parenting strategies, and use of technologies. We also sent cultural probes for children with two parts. In the first part, we asked children to draw their neighborhoods and mark spots they often go to and spots they wish they could go alone. The second part includes several short questions about their outdoor activities and interactions with their communities.

ANALYSIS OF FORMATIVE RESULTS

After collecting formative data, the interviews were transcribed and coded segments were clustered and selected by qualitative analysis, applying affinity mapping and grounded theory. Our core findings include 5 Implications for Design. The first three implications are major functionalities to enhance the social fabric and the last two implications address social problems in new technologies.

1. Encourage independent mobility

Parents wish their children to go outside alone and be more independent, but even simple navigation tasks that are trivial to adults can be obstacles for them. For example, P4, whose kid is only 5 years old, shared *"My son needs to learn how to cross the street on his own."* Also, children often have misconceptions about the dimensions of their neighborhoods. One cultural probe drawing (Figure 1) shows Birchwood Cafe (written as "Berchwood"), Matthews Park, and Co-Op close together. An actual map (Figure 1) shows that these locations are each several blocks apart. If children are not familiar with their neighborhood, they may not be able to navigate independently. Thus, technology solutions should encourage children to explore and train them to be more independent.

Figure 2: The HelloBox

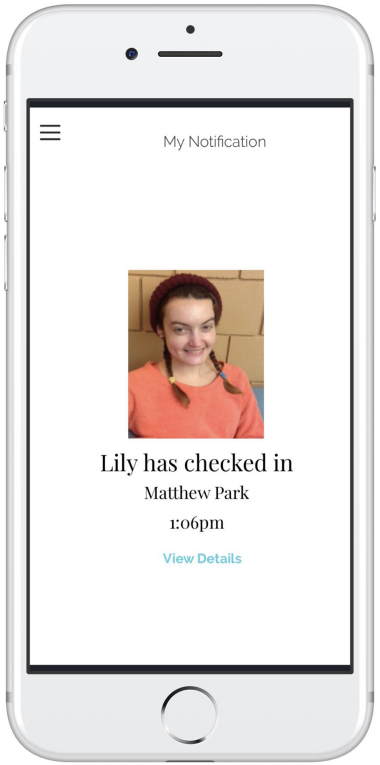

Figure 3: The check-in message parents will get

2. Maintain safety and perception of safety

Parents worry about neighborhood hazards such as traffic and crimes. P5 expressed his concern about traffic danger: *"Crossing the street alone is dangerous because of the over speeding issues and there aren't enough traffic lights."* P2 described her concerns about crimes: *"There are too many drunk people around"*, *"There was a shooting 5 blocks away."* Solutions should help keep kids safe from all of these hazards.

3. Build community in a neighborhood

Some participants regard their neighborhoods as supportive communities that they can rely on. As P1 and P4 suggested, neighbors can help supervise children: *"When kids are playing outside, if [neighbors] noticed anything wrong, they will help"*, *"My neighbor's son and my son play in the [apartment building] hallway and usually we just help each other to check on them."* Some parents often teach children to seek help from trustworthy neighbors. For example, P5 shared *"Our children know 10-15 adults by names."* As trusted adults could provide help in emergencies, technologies should facilitate the connection between children and trusted adults in the neighborhood.

4. Durability and clumsiness with technology

Many children are clumsy or forgetful with technology. *"They are too young to carry something expensive because they may break or lose it,"* said P2. P4 suggested a potential solution: *"There might be wearable devices to track my son when he is outside alone."* A durable and wearable device makes it hard for children to break, lose, or forget to carry.

5. Affordability

Many families cannot afford cell phones or other devices for their children. As P2 and P5 shared: *"Cell phone plans are too expensive"*, *"We want something that's more affordable than children's phones"*. Our solution should be inexpensive so that it is available to most families.

SYSTEM DESIGN

We applied the IDEO design process and brainstormed 103 ideas as a team. We combined complementary or similar ideas, removed those unrelated to our findings, and decided a distributed check-in system, named HelloBox, as our final design.

The HelloBox system includes a secure mobile phone app for parents, wearable RFID tags and check-in stations with screens and RFID readers for kids. Parents must purchase an affordable RFID tag for each kid and create or join a family group with trusted neighbors using the app. When kids

Figure 4: Map feature of HelloBox

are outside alone, they wear a wearable RFID tag to check in at check-in stations (shown in Figure 2) at various neighborhood locations, such as parks and homes, and parents receive notifications in their app with kids' most recent locations (shown in Figure 3). The RFID readers will be high-frequency readers so that it can read RFID tags within the range of 16 feet and get kids checked in automatically. If kids do not check in when they are expected to arrive at the range of the next check-in station or if they check in at an unusual location, parents receive warning messages with details and they could identify whether or not it is normal (implication 1, 2). In addition, the system gives parents the option to broadcast kids' check-in status within their family group. For example, if a kid checks in at a playground, other parents in the group might choose to send their kids to play outside with others (implication 1, 3). When necessary, parents and kids may also leave each other voice messages or make a voice call using the system (shown in Figure 5). To help kids when they get lost, stations also provide kids home directions and interactive map (Figure 4) and allow them to send a help request with a voice message to all adults in their family group for urgent help if their parents miss their phone call or are unable to help in time (implications 2 and 3, shown in Figure 7). Based on the kid's voice message, adults may decide to come over to help, to talk to the kid on a voice call, or/and to notify the police using the app. If no adult responds to a help request in time, the police will also be notified. Passive RFID tags are very inexpensive and the station, which is waterproofed, may be funded by the government and families that volunteer to set up devices at homes (implications 3, 4 and 5).

The HelloBox builds stronger neighborhood communities by encouraging play times and friendships between neighborhood kids as well as connections between parents. As kids grow more comfortable out walking and biking on their own and the relationships between families strengthen, these kids will become more integrated into the social fabric of their neighborhoods. Kids' requests for help will also give parents an easy way to support their communities.

VALIDATION

We asked 3 interviewed participants and 4 other community members to provide feedback on our design. P3 and P5 like the balance of keep tracking of kids without giving kids cell phone. P4 prefers a real-time tracking system such as GPS. Two non-parents think HelloBox can give kids more freedom and more connection to the communities and one parent who has a ten-years-old kid agreed on this because she thinks her kid would have the ability to notice danger and ask for help using HelloBox.

LIMITATIONS AND FUTURE RESEARCH

Communications between parents and kids are limited, as they can only communicate when kids are at a station; future research should explore other communication options. In addition, for this

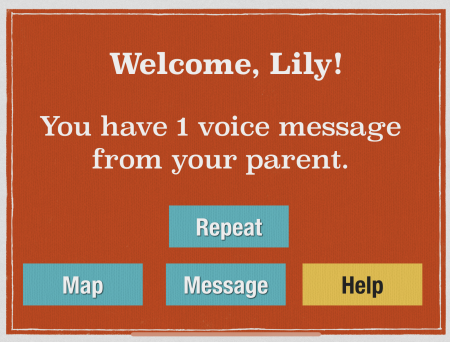

Figure 5: Voice message feature of HelloBox

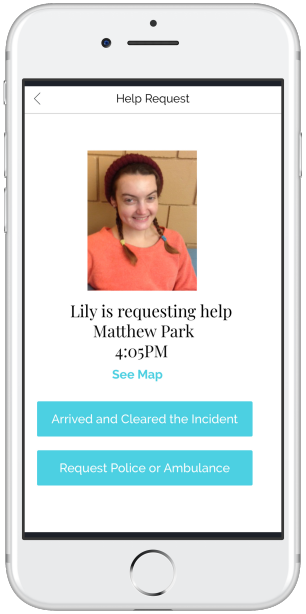

Figure 6: Urgent help feature for family group

system to be effective, the stations need to be distributed throughout the neighborhoods. Therefore, implementing this system would need to be a community effort, requiring many engaged families. A few individual families would not be able to use this system very effectively, as it would be more expensive and the reader stations would be sparse.

Future researchers could implement the HelloBox system in a local community and measure its impact on kids' outdoor play times or adults' trust in other families. Additionally, these outcomes could be compared to outcomes of alternative systems, such as GPS-based location tracking.

CONCLUSION

With HelloBox, families start to respond to children's help calls and volunteer to set up devices around their homes, which create social interactions that strengthen the social fabric of neighborhoods. We imagine a future where kids reclaim the great outdoors of their neighborhoods and become more independent in safer and more friendly neighborhood communities.

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