A Table Spinning Top to Enhance Family Quality Time

Noa Morag Yaar
noa.morag@milab.idc.ac.il
Media Innovation Lab Reichman
University
Israel

Ofir Sadka
ofir.sadka@milab.idc.ac.il
Media Innovation Lab Reichman
University
Israel

Aviv Yativ
avivyativ@gmail.com
Media Innovation Lab Reichman
University
Israel

Noga Rosenberg
noga.rosenberg@post.runi.ac.il
Media Innovation Lab Reichman
University
Israel

Gil Kfir
gilkfir1@gmail.com
Media Innovation Lab Reichman
University
Israel

Yonatan Ozbaher
yoni6931@gmail.com
Media Innovation Lab Reichman
University
Israel

Oren Zuckerman
oren.zuckerman@milab.idc.ac.il
Media Innovation Lab Reichman
University
Israel

Hadas Erel
hadas.erel@milab.idc.ac.il
Media Innovation Lab Reichman
University
Israel

ABSTRACT

Family dinners introduce an opportunity for quality family time which is significant for the development of emotional skills, life satisfaction and the establishment of a strong parent-child bond. However, family dinners are constantly challenged by mobile distractions. We present the design and preliminary evaluation of a peripheral Tangible User Interface, in the form of a table spinning top. The object is aimed at enhancing family quality time by raising awareness of mobile phone distraction and motivating family members to return their focus to the family activity. A preliminary user study with three families revealed high engagement and increased motivation for stopping mobile distractions and re-engaging in the family interaction. Our results suggest the prototype can assist in regulating digital interference in a constructive and positive way.

KEYWORDS

Family quality time, Tangible user interface, Parent child interaction, Mobile distractions

1 INTRODUCTION

Parents play a key role in the social, emotional and mental development of their children [19, 39, 46]. Quality time spent between

parents and children is one of the most important factors in child development. It can help parents build a stronger bond with their children [37], have a significant positive impact on children's sense of belonging [23], social skills [45], emotional skills [28] and life satisfaction [1, 16, 42]. Quality time has several distinct attributes, such as being attentive and fully present, sharing emotional experiences, discussing sensitive subjects, and fostering open communication where the child feels comfortable asking questions [11, 17, 36].

Family dinners introduce a valuable opportunity for family quality time [3]. Research has shown how routine elements of family dinner, such as assigned tasks and exchange of daily information are related to children's well-being [18]. Yet today, even when families manage to have family dinners, they are often distracted by digital technologies that challenge the positive nature of togetherness [2, 21, 22, 41, 41]. Research shows how mobile phones add constant distractions to family quality time, shifting family members' attention to non-family-related issues [10, 38]. These digital distractions can lead to emotional unavailability, divided and lack of engagement [9, 38]. Interference with family quality time can lead to feelings of resentment and frustration for both parents and children [7].

Several strategies have been offered to address the negative impact of mobile phones. These include interventions that actively restrict mobile phone usage [4, 13, 25, 48, 49] and interventions that raise awareness through providing data over phone usage [27, 33, 35].

We suggest an alternative approach in which the technology is leveraged to motivate family members to minimize their engagement with their phone and therefore reduce the distractions. Instead of blocking digital devices or solely providing data over phone usage, we suggest that a Tangible User Interface (TUI) may serve as a motivating object, raising awareness and encouraging family members to direct their attention back to the family context. Being screen-less, the TUI can potentially provide a reminder in the *physical world* [14, 24, 30]. The physicality, spatial presence, peripheral nature, and capacity to foster collaboration, [15, 29, 43, 50] suggest

Figure 1: Left: Family at dinner time with the TUI in the middle; Middle: The spinning top TUI showing the base and the rotating top; Right: To stop the rotation, all family members are invited to touch the TUI's base, reflecting a moment of togetherness (Photos were taken with consent).

Table 1: Families included in our studies. The sample comprises both genders, with females (F) and males (M).

Family #	Parents	Children	Study
1	M40, F38	F15, M12, M9	Need study
2	M40, F40	F14, F12	Need study
3	m49, F48	M17, M14,	Need study
4	M45, F42	F12 M8, F6	User testing
5	M52, F52	F16, F13	User testing
6	M42, F42	F12, M10, F7	Preliminary Evaluation
7	M54, F53	F15, M13, M13	Preliminary Evaluation
8	M46, F43	M16, M14, F9	Preliminary Evaluation

that TUIs are a potential candidates for raising awareness of digital distraction in the context of family quality time and increasing the motivation to minimize them.

In this work, we present the design and preliminary evaluation of a peripheral TUI. The TUI was designed in an iterative design process in which the values, pains, motivation and needs of family members, were identified and validated. In order to enhance family quality time, the TUI was designed to indicate mobile distractions by a subtle movement. Stopping the movement of the TUI requires the engagement of all family members, encouraging collaboration for minimizing the distractions of mobile phones during family dinner time.

2 RELATED WORKS

Previous research includes studies evaluating interventions for reducing mobile phone use in a family context and studies evaluating the impact of TUI on family interactions.

2.1 Technological interventions for reducing mobile phone-usage in a family context

Digital applications that restrict phone access are a common approach to regulate phone usage, however they are highly invasive, especially for families that value open communication and trust [4, 13, 25, 48]. Studies also show that this approach may lead to the opposite effect of increasing the desire to use the phone [49]. A less intrusive approach to reduce mobile phone usage involves providing data concerning phone usage [27, 33, 35]. Although providing data has been shown to enhance users' awareness of their intentions to decrease phone usage, it ultimately results in feelings of remorse and humiliation due to frequent disregarded notifications [34].

2.2 Tangible-user interfaces for enhancing family interpersonal communication

Several TUI prototypes were designed to enhance a sense of connectedness in the context of parent-child interaction [5, 8, 12, 20, 31]. One example is the tangible seesaws designed to support remote communication between a child at home and a parent at work. When a parent or child physically manipulates their seesaw, both devices move synchronously [47]. In the context of co-located family interactions, TUI prototypes typically focus on supporting

parent-child interactions. For example, a TUI designed for regulating parental role in a parent-child collaborative activity by encouraging parents to use the tangible to set their role in the activity along a scale between "peer" or "mentor". The TUI raised parents' awareness and led to reflection on the constant need to adjust their role to the child's needs and to the dynamics of the interaction in general [44].

These works show the challenge of restricting mobile usage using a negative intervention, and the potential of TUI as a positive intervention for enhancing family interactions (see figure 1). We extend previous work by designing a TUI for families in the specific context of family dinner, aiming to increase motivation for family interaction, without forcing any limitations.

3 DESIGN

The design process started with a need study and continued with the design of a mid-fidelity prototype.

3.1 Need Study

To better understand family dynamics and challenges related to communication at dinner time we interviewed two psychologists specializing in family therapy and three families (see table 1). Thematic analysis of the interviews [6, 26] revealed that families commonly struggle to create meaningful and authentic communication where all family members are present and engaged. Another finding was that family members commonly share the same space when at home, but are usually immersed in their own screen: "this leads to superficial communication which doesn't allow openness and meaningful communication" [P1]. They emphasized that when immersed in a screen, a lot of information is lost: "It's important to have a moment of eye contact ... important cues are expressed through body language and not through words" [P2].

When discussing challenges of families in the home (see table 1) we learned that the hectic routine is a barrier for spending time together. Moreover the thematic analysis indicated that in the context of dinner, all family members are distracted by digital devices and are upset when other family members are distracted: "sometimes we look at the phone for a moment and the kids are upset by it. I feel guilty" [P3]; "The children constantly want their father's attention but he cannot always be attentive and they are very offended by it" [P5]. From the need study we concluded that there is a great need for supporting meaningful family time and that the solution should

include all members of the family, it needs to enhance eye contact and be introduced in the context of family dinner.

3.2 Interaction design and User testing

Based on the insights from the need study, we created a mid-fidelity prototype. The design was inspired by the aesthetics of Zen objects, to hopefully blend in the family dinner and not capture attention. The known TUI advantages of collaboration [29], and multiple points of interaction [43] were leveraged to include all members of the family in the interaction. To raise awareness towards mobile distractions, the TUI was designed to perform a subtle and minimal rotation movement that is triggered when one of the family member's touches their phone. If the distraction continued, the rotation speed was gradually increased to capture more attention. After the rotation event started, there was only one way to stop it: all family members must touch the base together, leading to eye contact, and encouraging togetherness.

To minimize distractions, we have chosen not to include additional indicators such as lights or sounds. When one family member notices the spin and touches the strip on the base, the TUI will slow down. When all members touch the strip, a short vibration will be activated to signal success and the spinning top comes to rest (see figure 1).

In two user testing sessions (see table 1) we tested the aesthetics, understanding of the connection between the rotation and the phone use and perception of the need to mutually touch the TUI in order to stop the rotation. In terms of aesthetic, one mother said that the shape is relaxing and reminds her of a sculpture in a museum [F, 42]. Another said "I like the aesthetic, it's a nice addition to the table, apple-like and innovative [M, 45]. Family [1] easily noticed the rotation but thought it was too slow. In addition, they didn't understand where they had to touch the surface in order to stop the movement. Family [2] also indicated that it is not clear when the TUI was activated ("on"). Based on these insights we adjusted the rotation speed to gradually increase when distracted and then gradually decrease when touched. We additionally changed the location of the touch point to make it more noticeable. Finally, we added an activation action to indicate when the TUI is "on": one member flips it and places it in the middle of the base, also serving as an unspoken commitment to avoid using phones at the table.

4 PRELIMINARY EVALUATION

Three families (see table 1) participated in the study that was approved by the ethics committee of the University.

4.1 Participants and procedure

Families were recruited for the study with the inclusion criteria that they have 2 children or more and dine together at least once a week on a regular basis. Upon arrival at their house, researchers provided a short description of the study and how their confidentiality would be protected. We then placed the TUI on the table and one family member flipped it to activate it. We used the WoZ technique in which the TUI was remotely activated by the researcher but was perceived by participants as working autonomously [32]. The researcher made sure to not interfere with the natural interaction of the family. Whenever someone used the phone, the TUI

was activated and started its gradual movement. During dinner one researcher (who stood in a distant location) observed the family interaction and took notes. After each session, we conducted a 15 minute semi-structured interview with each family member separately to gather feedback about their experience.

4.2 Findings

Three researchers analyzed all the transcribed interviews and observation notes using thematic coding [6], progressing from initial themes to mutually agreed themes by discussing inconsistencies. We chose thematic coding as we wanted to uncover the participants' interpretation and meaning of the interaction. The analysis revealed four main themes: (1) Phone usage during dinner (2) Family involvement and dynamics (3) Togetherness around the dinner table, and (4) Usability of the TUI.

4.2.1 Phone usage during dinner. In all cases, at least one member has noticed the rotation. It immediately triggered a desire to respond and stop its movement: "the moment I saw it was moving, I wanted to touch it" [M, 12]. The gradual movement didn't go unnoticed, and it encouraged the family members to be active and engaged: "The faster it moved, it made me want to touch it quicker" [M, 14]. The TUI interaction not only reduced phone usage around the table, but also increased participants' sensitivity: "I cared more when someone was on the phone" [M, 40]. Moreover, participants stated that the TUI directed their attention back to their family and the dinner context: "There was something about it that brought back the focus after the distraction" [M, 42]. The decrease in phone use was clearly noticed by all family members and it led to highly positive emotions: "surprisingly dad was not on the phone this time, except once, which was very nice" [F, 15].

4.2.2 Family involvement and dynamics. An interesting dynamic was that the participant who noticed the rotation first directed all family members' attention to the movement: "look it's moving" [M, 53]; "It's rotating, quick quick stop it" [M, 16]; "touch it so it will stop" [M, 14], "look, everyone should touch, it's rotating" [F, 12]. When the rotation didn't stop participants directly turned toward the family member who was using the phone: "Let's stop it quickly this time" [M,42], "you are making it more difficult" [F, 7]. In most cases, this made family members put down the phone and direct their attention back to their family. In the observation we noticed that the participants' reaction to the movement encouraged the members to leave their phones and touch the strip. For example a mother [F, 53] answered a phone call regardless of the movement but was quickly encouraged by her family members to stop her conversation and get back to dinner. In all observations, when encouraged by other members, the one who has used the phone stopped. On one occasion a young participant [F, 9] left the table but was called back to touch it so it would stop. On another, a mother ignored the rotation at first and continued her phone call but then was hurried to finish her call by her kids and touch the TUI. "Mom, touch also, the spinning top is still moving" [M, 12]. It seems that encouragement from other family members was the element that convinced them to participate. They felt that touching the TUI needed to be a joint act. "Hey, stop it with me, don't leave me here alone" [M, 46].

4.2.3 Togetherness around the dinner table. Participants reported that the TUI connected them around the table: "I don't think it impacted the dining as it made us be together. We needed to stop it together so it made us be together". [M, 46]. They talked about the need to sit closer physically around the table. A young participant said: "it made us sit close to each other so we can all reach it to touch it" [M, 14]. "It was fun we did something together...you cannot do it without the others" [F,12]. "The spinning top made all of us sit together around the table" [F,43]. In our observation we noticed that when the movement stopped, members of the family smiled, laughed and made eye contact.

4.2.4 Usability of the TUI. From our observation it was apparent that all members understood that the movement was connected to phone usage. Every time the TUI started its rotation, at least one member, usually one of the children, noticed the rotation and tried to interact with it. "It's moving, all touch it with your finger now" [M, 54], "It's rotating, quick quick stop it" [M, 16]. All families also noticed and appreciated the vibration when the TUI stopped completely and clearly understood that all needed to touch it to make it stop.

5 DISCUSSION

In this study we explored a novel TUI for minimizing the impact of mobile phone distractions during family dinners. The TUI was designed as a peripheral object that signals when a digital interference occurs and indicates that the attention should be shifted back to the family quality time. Our results show that the TUI was successful in raising awareness of digital distractions, and the tangible manipulation successfully brought family members' attention back to the family dinner context. They were quick to notice that there is a distraction and were encouraged to collaborate in order to stop it.

The engagement of all family members in stopping the TUI's movement had two effects. First, the phone usage reduction was mediated by family members, instead of the technology forcing or even signaling to the phone's user about his or her undesired activity. Family Members, mostly those who were not on the phone, coerced other members to stop using their phones in order to succeed in stopping the TUI. This has a highly positive effect as the need to minimize distractions comes from the most important people in one's life, instead of a technological device. Second, the joint action of touching the TUI in order to stop its movement led to collaboration and a sense of togetherness between parents and their children, creating a joint experience. This shared goal unified the family and facilitated meaningful mutual moments. Following the interaction with the TUI We noticed that the smiles, laughs and eye contact has increased between members.

Our TUI extends previous work by presenting an awareness peripheral object that indirectly leads to behavioral change through other family members. Counter to other digital strategies that can be somewhat aggressive in their approach, our intervention raises awareness and encourages family members to take action for more family time together. This indirect approach leverages the unique dinner time and the family members enthusiasm to reach a mutual goal, creating an opportunity for reducing distractions and facilitating a togetherness moment.

6 LIMITATION

Due to the preliminary nature of the study, only eight families participated in the study. We acknowledge the fact that Family structure and dynamics can also mediate the TUI influence, therefor it should be tested overtime. Such testing will also allow for identifying novelty effects. Finally, qualitative assessment may involve the "good subject effect" [40]. To address this limitation, we followed a strict protocol and assured our participants that all responses are equally important and valuable.

7 CONCLUSION

In this work we show the great potential in leveraging TUI for minimizing digital distractions in a family dinner context. The TUI facilitated collaboration among family members by presenting a shared goal which mediated the motivation for stopping the digital distraction, thus preserving the valuable time they spend together. It would be intriguing to explore the impact of the TUI in diverse cultural settings to determine if the results are consistent.

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