Master's Thesis

Codesign Between Parents And Children: What Is Smartphone Management Services Involving Active Mediation?

Yungu Kang

Department of Design

Ulsan National Institute of Science and Technology

2023

Codesign Between Parents And Children: What Is Smartphone Management Services Involving Active Mediation?

Yungu Kang

Department of Design

Ulsan National Institute of Science and Technology

Codesign Between Parents And Children: What Is Smartphone Management Services Involving Active Mediation?

A thesis submitted to
Ulsan National Institute of Science and Technology
in partial fulfillment of the
requirements for the degree of
Master of Engineering

Yungu Kang

01/16/2024 of submission

Approved by

Advisor
Hwang Kim

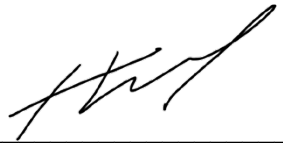
Codesign Between Parents And Children: What Is Smartphone Management Services Involving Active Mediation?

Yungu Kang

This certifies that the thesis of Yungu Kang is approved.

01/16/2024 of submission

Signature



Advisor: Hwang Kim

Signature

Committee Member: Chajoong Kim

Signature

Committee Member: Hongyeol Eom

Signature

Codesign Between Parents And Children: What Is Smartphone Management Services Involving Active Mediation?

Yungu Kang

Department of Design

Ulsan National Institute of Science and Technology

ABSTRACT

Since smartphones become our everyday product, there have been lots of discussions on how to control the use of their children while keeping their autonomy. However, many current digital solutions between parents and their children could not address concerns of both user groups. Therefore, the study figured out the opportunities and challenges associated with parental intervention in the children's use of smartphone. Parental restrictive mediation methods commonly used in existing services have problems in various aspects such as the relationship between parents and children, and the autonomy of the child. On the other hand, 'active intervention' encourages discussion and communication between parents and children and holds potential for new service opportunities. This study identifies the elements required when designing a child management service with active mediation. Additionally, it extracts the design opportunities and challenges of active mediation services and proposes 4 ideas. A collaborative co-design workshop was conducted in which both parents and their children participated. The findings from this study definitively delineate the boundaries of active mediation, grounded in the experiences of the participants and novel ideas for the smartphone management. The study could also serve to bridge the gap between previous studies and current digital mediation service design grounded in the principles of active mediation and multi-disciplinary knowledge.

This thesis is follow-up study of my research for the submission of DRS conferences. The thesis is based on the same experiment of the researcher's DRS submission.

Contents

1. INTRODUCTION

1.1. Research Background

As the smartphone usage rate in childhood increases, parents' concerns associated with technological exposure are also deepening**(Danet, 2020; Genc, 2014; Haddon & Vincent, 2014)**. While parents want their children to benefit from the convenience and innovation that offered by digital educational contents **(Subrahmanyam & Greenfield, 2008)**, but they worry about their children's misuse of smartphones, fearing that their child might become victims of cyberbullying, hinder their cognitive development, lose sleep**(George & Odgers, 2015)**. Parents of school-aged children were concerned that ICT could harm child development and have negative impacts on family functioning and relationships(Danet, 2020). In fact, it has been reported that the overuse of digital devices can affect sleep quality(Chung et al., 2018) and leads to an increase in musculoskeletal problems **(Harris & Straker, 2000)**. Furthermore, smartphone addiction is correlated with low academic achievement**(Samaha & Hawi, 2016)**. On the other hand, the argument that children's digital use itself causes mental problems for children remains controversial. In Odgers' paper, it was argued that excessive parental concern about children's smartphone usage has recurred throughout history, and the current debate is not much different from when Mary Preston submitted her study on the impact of radio on children **(George & Odgers, 2015)**. While It has been revealed in previous studies that digital addiction negatively affects children, but there cannot be objective definition of the "excessive use" of smartphones that leads to addiction (Lanette et al., 2018). This suggests that parents' fear may manifest as an inappropriate way to mediate their children's smartphone use.

The factors influencing parental mediation include parents' perceptions of smartphone addiction, parenting styles, parent-child relationship and personality types **(Bi et al., 2018; Kitamura et al., 2009; Naab, n.d.; R. Warren & Aloia, 2019)**. The more seriously parents perceive the consequences of smartphone addiction, the more likely they are to engage in mediation behaviors. Furthermore, parents with authoritarian tendencies tend to interfere more with their children's smartphone usage. Hwang's research stated that parents who lack emotional stability are more likely to engage in restrictive mediation than active mediation. Parents who have open attitude about experiences from smartphone usage are more likely to participate in active mediation, but there is no correlation has been found with

the use of restrictive mediation **(Hwang & Jeong, 2015)**. However, it has not been determined how the encouragement of parental mediation strategy choices through design might, in turn, affect changes in the parents' personalities. The design of child management services that focus on restriction and are becoming trendy among parents can shape long-term parenting habits and, therefore, could influence their parenting philosophy or perception of their children's smartphone use. This is why child management services need to be considered more carefully.

South Korea is one of the digital friendly countries for children where it has been reported that 96.5% of 10-year-old kids in South Korea own one(MSIT, 2022). A number of South Korean parents use parental management services to regulate their children's smartphone usage. Consequently, controversies have continued to arise due to excessive restrictions and privacy infringements caused by smartphone mediation services (Kim, 2019). Representative services that manage children's smartphone use include "Google Family Link" and "Screen Time." Many other services such as ZEM, xKeeper, KidsGuards, Kids360, I-believe, MobileFence, Findmykids also provide additional control functions along with functions to control children's smartphone usage time. It remains controversial whether parents simply control their children's "screen time" helps their children use their smartphones correctly, and more important than smartphone time is to check "what" and "how much" they used (Mascheroni et al., n.d.). Despite this, numerous monitoring apps have been released even now. And some of these apps have features that allow direct control of a child's smartphone, as well as spy on SNS, call records, and message logs. Among South Korean parents, there is the saying that "The lower the rating an app receives from a child, the more parents trust the app."

In particular, many child management services, such as ZEM, have incorporated features that reward children when they adhere to their parents' rules, inducing a behavior known as Parental Conditional Regard**(Assor et al., 2004; Assor & Tal, 2012)** which causes a child's emotional regulation to be passively influenced by parental decisions. Although external motivations from parents can interfere with a child's autonomy, most existing designs still stimulate the desire of parents to control their child's behavior. D. Norman has pointed out in his book that design reflects the capitalistic importance of the market, emphasizing external features that are perceived as attractive to buyers, which indicates that we are surrounded not by objects of use but by objects of desire(Norman, 2013). Applying Norman's words, it can be seen as 'Good for business but bad for children's rights.' Therefore, there is a need for a new design solution that moves away from the existing child management services focused primarily on parental motivation for surveillance or restriction, towards considering the children as equal participants.

1.2. Research Aim & Questions

Emotional improvements are made compared to the restrictive mediation variables such as disciplines, monitoring, restrictions of existing children's management services. Therefore, it is extracted the ideal active mediation and the variables of restrictive mediation from the perspectives both parents and children. Qualitative research has been conducted based on the workshop with parents and children associated with active mediation and co-use within the proposed ideas. The research questions (RQs) for this study are as follows:

- *RQ1) What do children aged 7-12 and their parents in Korea consider as the ideal form of active mediation of children's smartphone usage?*

- *RQ2) What are the opportunities and challenges for applying active mediation in the service design idea proposed by Korean children aged 7-12 and their parents together?*

The results of the workshop provided answers to RQ1) The discussion gained from the workshop provided answers to RQ2) Elements of active mediation, "conversation, sharing, and discussion" is a concept that is applied naturally as parents and children participate in the workshop process together and share opinions about the topic. In essence, design opportunities, challenges, and understanding of active mediation through the co-design workshop structured within the context of active mediation have been expanded.

2. LITERATURE REVIEWS

2.1. Developmental Psychology

2.1.1. Parent – Child Relationship

Parental Conditional Regard (PCR) is actions that a parent gives or withdraws affection or approval depending on children's compliance with parental expectations (Assor et al., 2004). Parents may not easily recognize it, but a detrimental behavioral habit that damages the parent-child relationship is Parental Conditional Regard. PCR involves giving love, attention, and approval when a child behaves as the parent desires and withdrawing them otherwise. Previous studies have described that PCR has a negative impact on children **(Assor & Tal, 2012; Roth et al., 2009)** It can be argued that parents regulating their child's smartphone use and giving rewards and punishments is a form of conditional regard. Relationship Motivation Theory (RMT) implies the importance of forming smooth social relationships in self-determination**(Haines & Schutte, 2023; Ryan, 2000)**.

Self-Determination Theory (SDT) argues the premise that the motivation for controlling behavior is at its lowest when actions are performed due to external coercion or pressure from others (Ryan, 2000). The enforcement of restrictions by parents without persuasion is an external motivation for the parents, which can lead to problems in teaching autonomy in a child's smartphone use in the long term. Parental autonomy support can enhance a child's self-determination (Joussemet et al., 2008). Therefore, existing restrictive mediation services could have a long-term negative impact on the emotional development of children.

2.1.2. Child Autonomy

Children's autonomy is defined as "A sense of being choiceful in one's actions and experiencing oneself as the locus of initiation of those actions" **(Deci & Ryan, 1985)**. Successful parenting is related to the support of a child's autonomy (Joussemet et al., 2008). The debate over methods of autonomy respect versus control in parenting has continued **(Law et al., 2010; Young & Tully, 2022)**. Among parental mediation behaviors, the most threatening to child's autonomy can be inferred as restriction and monitoring. However, previous research suggested that parental monitoring is not significantly related to autonomy-supportive parenting, indicating that the how parents communicate about monitoring is more important

than itself**(Young & Tully, 2022)**. There are some researchers even propose that monitoring can make children feel cared for by their parents**(Dedkova & Smahel, 2020)**. Ideal monitoring can enhance communication with the child when done by parents who care child's autonomy more than restriction(Rodríguez-Meirinhos et al., 2020). On the other hand, children may feel psychologically and emotionally restricted by some practices which their parents believe as protective, since their autonomy has been infringed. Thus, there is a subtle balance between parental interference and autonomy respect, and it is truth that "How" parent do for their child than "What" to respect child's autonomy.

2.1.3. Parent Role-modeling

Bandura proposed that the most important process in social learning is imitation, arguing that people can learn by observing the behaviors or outcomes of others (Bandura, 1978). According to previous research, children adopt their parents as role models and are influenced in various personality aspects such as perfectionism, violent tendencies, career choices, and others(Curran et al., 2020; Mascheroni et al., 2018, p.128). Indeed, parents' problematic media use can influence their children's usage habits**(Holtz et al., n.d.; Hwang & Jeong, 2015)**. This indicates that children can not only learn about digital habit from their parent's verbal and physical actions but also imitate the parent's digital usage frequently which has been seen at home, suggesting the importance of parents' daily habits.

2.1.4. Psychosocial Development

According to Erikson's theory of psychosocial development, it is defined in 8 stages explaining the psychological virtues and maldevelopments that humans acquire as they grow from infancy to elderly. The psychological conflict of the school-aged (7 to 10) period is called as "Industry vs Inferiority", an age where children compare with each other. After the age of 11, adolescence begins with concerns about identity and social relationships (Batra, 2013; Erikson, 1985). Developmental psychologists asserted that children between the ages of 7 and 12 are learning about competition and cooperation while accelerating in mental growth through repeated cooperation and competition with peers. Simultaneously, it is a period for setting

standards within a group, comparing themselves to those standards, or finding ways to meet those (Michael G. Thompson, 2002). In other words, during this period in which Korean children enter elementary school, social relationships in school and peer groups should be considered as much as the context of their home.

2.1.5. Digital Parenting

Parents use ICT to achieve parenting goals such as the development of the parent and child, family development, and the improvement of parent-child relationships. Using ICT can enhance the quality of parenting **(Walker & Rudi, 2014)**. In the research by Livingstone et al., the relationship between offline and online parenting can be explored into five dimensions that should be considered in parental methods that positively affect adolescents with the intervention of ICT. These dimensions include 1)Connection - positive and stable emotional bonds between parents and adolescents, 2)Behavioral Control - setting behavioral rules and their consequences, 3)Respect for Individuality - allowing adolescents to develop their own sense of self, 4)Behavioral Modeling - parental role modeling, 5)Provision and Protection - online protection (Mascheroni et al., 2018, p.19). Modecki K et al. argued that digitalization will continue in the future, and therefore, clear and comprehensive research is needed on functional approaches to digital parenting(Modecki et al., 2022).

2.2. Parental Mediation

2.2.1. Parental Mediation Model

The structure of parental involvement in their children's digital usage is termed Parental Mediation **(Livingstone & Helsper, 2008)**, encompassing four categories: Active Mediation, Restrictive Mediation, Co-use, and Monitoring. Active Mediation (AM) in smartphone usage involves parents sharing information about correct usage, guiding, and discussing the opportunities and risks associated with smartphones. Restrictive Mediation (RM), on the other hand, involves parents setting direct rules and controls, such as limiting usage time and accessible content **(Mathias & Singh, 2023).** Co-use refers to various methods where both parent and child participate as users of media. In contrast, monitoring implies parents supervising their children's media use from a managerial perspective. Both co-use and monitoring are

included in the mediation model; however, co-use is interpreted as a category of AM **(Livingstone et al., 2017; Livingstone & Helsper, 2008)**, and monitoring as a category of RM (Kirwil, 2009).

The mediation strategies proposed in existing studies have been expanded conceptually to accommodate various media such as smartphones, computers, and online gaming. Clark has presented participatory learning as a new strategy of mediation analogous to active mediation, highlighting activities that encourage individual and collaborative creativity and cognitive development in relation to various forms of digital, mobile, and more traditional media, where parents can participate with their children (Clark, 2011). Additionally, Lee has described Co-use in the context of smartphone use as a concept similar to active mediation and explained how it can appear in conjunction with restrictive mediation(Lee, 2021). Such complexities within the context of media use indicate that parental mediation strategies can flexibly combine, adapt, and evolve into diverse forms (Jiow et al., 2017).

Prior studies have differentiated between communication-centered active mediation and rule-setting, control-centered restrictive mediation, specifying that newly emerged mediation methods could incorporate a mix of both active and restrictive concepts(Clark, 2011; Jiow et al., 2017; Kirwil, 2009; Lee, 2021; Livingstone et al., 2017). Therefore, this study categorizes parental mediation broadly into active and restrictive approaches and includes derivative parental mediation behaviors based on conceptual similarities. For instance, in the context of parental and child smartphone use, co-use and participatory learning are considered active mediation due to their foundation in communication and education, while monitoring is categorized as restrictive mediation due to its close association with parental control and rule-setting.

2.2.2. The Discourse of Restrictive & Active Mediation

According to prior research, parents of elementary school children (ages 7-12) in South Korea tend to implement Restrictive Mediation (RM) over Active Mediation (AM) (Lee, 2021). In the context of smartphone usage, RM is often employed in conjunction with monitoring within children's smartphone management services. Parents believe that regulation and blocking effectively prevent their children from using smartphones excessively and perceive this as more efficient than active management, which requires the parent's time and attention over an extended period. Contrary to parents' beliefs, however, restrictions have been shown to be ineffective in preventing smartphone addiction in (Lee & Ogbolu, 2018). Moreover, excessive parental restrictions can deteriorate the parent-child relationship

(Lauricella et al., 2015; Xie et al., 2019) and block opportunities for children to benefit from digital technologies (Benrazavi et al., 2015).

On the other hand, previous studies have validated the effectiveness of Active Mediation (Buijzen & Valkenburg, 2005; Kalmus et al., 2015; Nathanson, 1999). Nathanson's research stated parents' restrictive mediation strategies on children's TV viewing has the 'backfire' effect, where restriction could increase children's aggression, suggesting that active mediation methods could be the most effective approach for television mediation (Nathanson, 1999). Kalmus emphasized that the more children use the internet, the more parents try to restrict their smartphone use then it could lead to adverse outcomes (Kalmus et al., 2015). Buijzen's study on the undesired advertising effects indicated that even with restrictive methods, children could still be exposed to inappropriate content for several hours each day; therefore, active mediation could be effective in mitigating the adverse effects on children(Buijzen & Valkenburg, 2005). Additionally, distinguishing between concept-oriented and social-oriented approaches to parent-child communication, the studies reported that the concept-oriented approach, which encourages active discussion, could be more beneficial than the social-oriented approach that seeks obedience and harmony. This distinction in communication styles between parents and children has contributed to defining effective active mediation. This study aims to concretize active mediation and derivative active mediation-based approaches, proposing how the previously vague concept of active mediation could be applied in child management services.

2.3. Design Research Related Parental Mediation

2.3.1. Major Attempts to Implement Active Mediation

Parental mediation has been applied to design in various ways, such as child management apps (Google Family link, Screentrime), but there has been limited research on how to utilize parental mediation strategies in design. FamiLync is a research through design study that tested the effectiveness of a smartphone application design that applies family engagement to restrictive mediation theory through digital service design development. FamiLync proposed the "participatory mediation service" which is a design centered on restriction and monitoring, combined with the concept of co-use. Kim's team

suggested a design centered on restrictive mediation based on control and monitoring combined with the use of family collaboration, which is closely related to active mediation. The researchers of FamiLync report that their design, which allows families to set time limits together and share their usage in a leaderboard feature for comparison, could reduce reliance on restrictions by parents and foster empathy towards limited smartphone use in children, thereby facilitating parent-child interactions. The FamiLync research team described that the Participatory Mediation they proposed through their design helped maintain positive relationships through family conversations, as opposed to traditional restrictive services. This suggests that active mediation services can be an alternative and improved solution, being less focused on child-centric and hierarchical authority structures between parents and children.

The child management service 'ZEM', designed by a major Korean telecom company, is more child-centric compared to other services, as it offers digital parenting content to parents, allows children to set their daily habits themselves and receives rewards for achieving goals. Despite this, the core features of ZEM still focus on location tracking and smartphone control for the kids, it is the limitation of parents forcibly controlling their children's smartphones. This has led to several issues as reflected in numerous reviews on the app store, such as children's complaints about their smartphones being suddenly disabled after the time has been set, parents' requests for more restrictive features, and concerns about invading children's privacy.

2.3.2. Codesign with Parents and Children

Co-design is a process in which designers and non-designers collaborate (Sanders & Stappers, 2008). Research including children in the codesign process has been attempted in various topics. The research team found several co-design studies related to children's smartphone usage. A study by A. Chowdhury discovered what the technical solution of digital intervention was by involving early adolescents in the codesign process (Chowdhury & Bunt, 2023). However, since digital mediation is a negotiation process between children and parents, the paper points out as a limitation the absence of parents' input in the design process. B. McNally codesigned Mobile Online Safety Applications with children aged 7-

12 in her research. They focused solely on children's technical proposals, primarily addressing online safety services, which makes it difficult to consider the context of various mediation situations beyond monitoring and restrictions (McNally et al., 2018). Codesign research related to children's use of smartphones has been conducted before, but this study is differentiated in planning workshops as part of the active mediation process and sheds light on active mediation, which has been less used and clear compared to restrictive mediation.

2.3.3. Codesign Workshop with Parents and Children

Co-design workshops help to concretize the project's problem exploration and definition stages(Steen, 2013). Collaborating with parents and children to participate in the design process can be important in producing skills that take into account the rich context of family life (Yip et al., 2016). Co-design workshops involving parents and children collaborating have been found to be underexplored in prior research. R. Garg and S. Sengupta organized a codesign workshop involving parents and children in their study, but parents participated in only a few of the entire workshop sessions. Therefore, there was a limit to fully understanding the context between parents and children through opinion sharing and cooperation(Garg & Sengupta, 2020). Zhang's study was unclear whether the requirements of parents and children are reflected equally in the design process (Zhang et al., 2022). In another codesign study conducted 'in-home activity' involving nine pairs of parents and children as some parts of the design process (R. Warren & Aloia, 2019). However, the difference from this study is that parents and children did not come up with ideas themselves. This study is unique as it involves parents and children in entire sessions of the codesign workshop to extract the experience of digital intervention from their perspectives, and parents and children proposed design ideas together.

3. RESEARCH METHODS

The goal of this study is to discuss about the ideal mediation as perceived by both parents and children concerning children's smartphone usage issues, and to find opportunities and challenges for active mediation applicable to parents' children's smartphone intervention design. I organized a co design workshop. The workshop was composed of a collage session conducted by parents and children seperately, idea sketching session conducted by each family as a team, and sharing opinions. A week before the workshop, pre-materials was distributed online to think about the topic.

3.1. Recruitment

Parents with children aged 7 to 12 were recruited through the online communities and Snowball Sampling(Faugier & Sargeant, 1997). Families with middle school adolescents were also included as subjects in the experiment, but were excluded during the recruitment since the child wished not to participate or due to scheduling reasons. However, smartphone use among elementary school children is still perceived as a problem in Korea, and previous research has highlighted the risks associated with exposing school-aged children to digital media (Chassiakos et al., 2016). Therefore, I shifted our recruitment to focus on families with elementary school children. A survey was used for recruitment, utilizing variables such as the age group of parents and children, their relationship, and mediation methods (active mediation, autonomy respect, restrictive mediation). Ethical considerations were taken into account by explicitly stating that the research would only proceed with participants who agreed to participate in offline workshops with their children. A total of 19 pairs of parents and children experienced a smartphone conflict, or families whose parents were concerned about their children's incorrect use of smartphones applied for this workshop. Most participants identified as the mother, with only one participant identifying as the father. Among the parent participants, 40% responded that their child is 4~6 grades in elementary school (aged 10 to 12), 35% were 1~3 grades (aged 7 to 9). 20% of children were middle school-aged, and 5% pre-school aged. The choice of parental mediation strategies showed an even distribution among active mediation, respect for autonomy, and restrictive mediation. 9 subjects and 11 of their children have been recruited, representing an even distribution based on the child’s age and sex, parental mediation which are responses of the workshop applicants.

3.2. Participants

20 participants were selected based on the responses of the applicants, consisting of 9 parents and 11 children. It is like the number of subjects recruited on other co-design studies involving children or families(Chowdhury & Bunt, 2023; J. L. Warren et al., 2023; Yip et al., 2016). One of the families was absent from the workshop, and two pairs of parents brought siblings of their children. In our study, 8 female parents and 1 male parent attended. According to an analysis by Statistics Korea, approximately 17K men who were not economically active due to 'childcare' reasons in 2023. Despite the increasing proportion of Korean men in childcare, it can still be said that women spend the most time with their children during the day as the primary caregivers. A total of 11 children participated in the workshop, including 6 boys and 5 girls. Among them, 7 respondents in the upper grades of elementary school and 4 respondents in the lower grades of elementary school. The average age of all parents was 40.78, and the average age of children was 9.55.

Table 1. Simple Description of Workshop Participants

Family	Description
F1	P1 : 40s, Mother, using child restriction service C1 : 11 year old, Boy
F2	P2 : 40s, Mother, Discussing about smartphone usage with her child C2 : 11 year old, Boy
F3	P3 : 30s, Mother, Using child restriction service C3 : 10 year old, Girl
F4	P4 : 30s, Mother, Using child restriction service C4 : 8 year old, Girl
F5	P5 : 30s, Mother, Using child restriction service C5 : 7 year old, Boy
F6	P6 : 40s, Father, Using child restriction service C6 : 7 year old, Girl
F7	P7 : 40s, Mother, Allowing her child to use a smartphone almost free. C7 : 10 year old, Boy C8 : 10 year old, Boy
F9	P9 : 40s, Mother, Using child restriction service C9 : 12 year old, Boy
F10	P10 : 40s, Mother, Allowing child to use a smartphone almost free. C10 : 11 year old, Girl C11 : 8 year old, Girl

3.3. Pre-workshop

A total of 20 participants (9 parents and 11 children) were surveyed in advance a week before participating in the workshop. The pre-survey was created and distributed separately for parents and children's groups and served as a sensitizer to gain an overall understanding of the context before participating in the workshop. The questionnaire was created through Google Forms. To allow participants to easily conduct the survey during the day, they were enabled to respond once a day from Day 1 to Day 7.

Table 2. Examples of Pre-workshop Survey Questions

Day	Examples of question
1	**Parent**: "On weekdays, how much time do you feel you use your smartphone? (average per day)"
2	**Parent:** "On weekdays, how much time do you spend with your child? (average per day)"
3	**Parent:** "What concerns you the most when your child is using a smartphone?"
4	**Child**: "What are the good and bad aspects of smartphones?"
5	**Child**: "When do your parents scold you about using your smartphone?"
6	**Child**: "When you are scolded for using your smartphone, what do your parents usually say?"
7	**Child:** "What do you find unfair when you have an argument with your parents about smartphone use?"

.

Parents were encouraged to self-report their smartphone usage hours on weekdays and weekends, and as well as the time spent with their children. The study results that self-reports on smartphone usage may be less than actual usage time, and considering the criterion for determining smartphone addiction is 8 hours per day, participants have been allowed a choice between 1 to 10 hours(Lanette et al., 2018). They were asked to describe the context of the conflicts related to smartphone usage with their children. The children's survey was designed to be simpler than the parents' survey. Children were asked to self-report their smartphone usage on weekdays and weekends, to describe the situation in which the child thinks they use the smartphone the most, and the parents' words and unfairness in the conflict. This approach aimed to increase participant engagement. On the day of the workshop, 15 minutes of ice-breaking were conducted by statistically sharing the answers of both parent and children groups. Enough snacks and drinks were provided for the children to focus on the activities.

3.4. Session 1. Generative Research with Collage sharing

In the first session of the workshop, participants were divided into parent and child groups and engaged in a collage-making activity (40min). The process of making artifacts enables people to access and express their experiences (Visser et al., 2005). Participants who were difficult to express were given an additional 10 minutes to fully express their creativity to complete their works. the topic has been given for the child group, "How can parents avoid conflicts when you use smartphones?" and for the parent group, "How can children avoid conflicts when they use smartphones?" Prior research indicated that when families participate a codesign workshop with a strange family, parents tend to focus more on the role of a 'guardian' for their child's protection rather than participating actively as 'participants' in the workshop. Also, they found that when parents and children were separated, parents actively participate in the workshop while sharing their parenting experiences(Yip et al., 2016). In this study, parent and child groups are separated, but to alleviate children's anxiety and fear about being separated from their parents, the parent group were placed in a room with a glass wall. The child group could see their parents participating in the workshop from outside the room. The workshop moderators provided each group with 10 magazines from various fields (home, lifestyle, electronics, technology, arts, and media), along with scissors, glue, pencils, colored pencils, and emoji stickers to help parents and children create more creative collages.

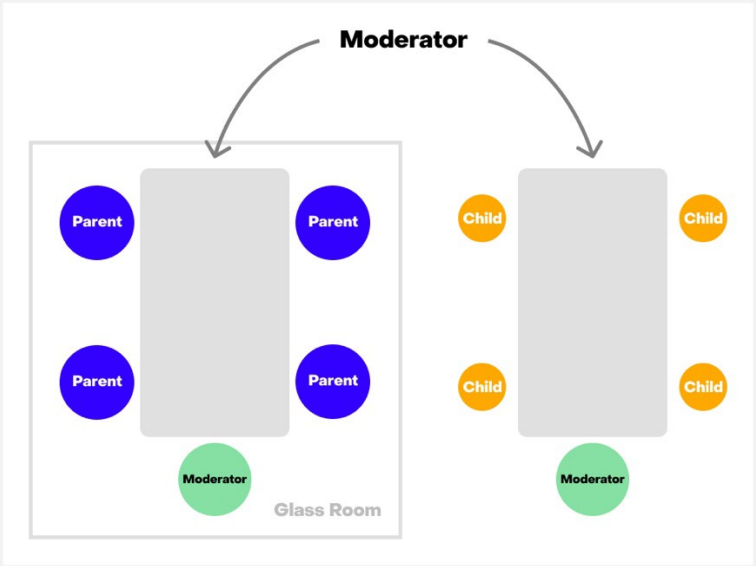


Figure 1. Participant arrangement for session 1

Figure 2. **Session 1 by the Parent and Child Group**

Next, moderators took photos of the collage artworks and projected them using a beam projector for everyone to see. Parents and children groups gathered in the same location and presented their works individually. To ensure that children did not have difficulty expressing their opinions and were not influenced by the parent group's presentations, the child group presented first. The facilitator asked questions about each expression of the artwork, starting from the upper left corner, and proceeding clockwise, prompting participants to explain their creations. Presentation times varied depending on the number of workshop participants, but each person was limited to a maximum of 10 minutes, including sharing opinions from other participants. After the presentations, participants were given Post-it to note any additional explanations about their works that they couldn't mention during their presentations. Following the session, participants had a 10-minute break. Facilitators divided the Post-it notes between the parent and child groups and attached them to the walls in preparation for the next session.

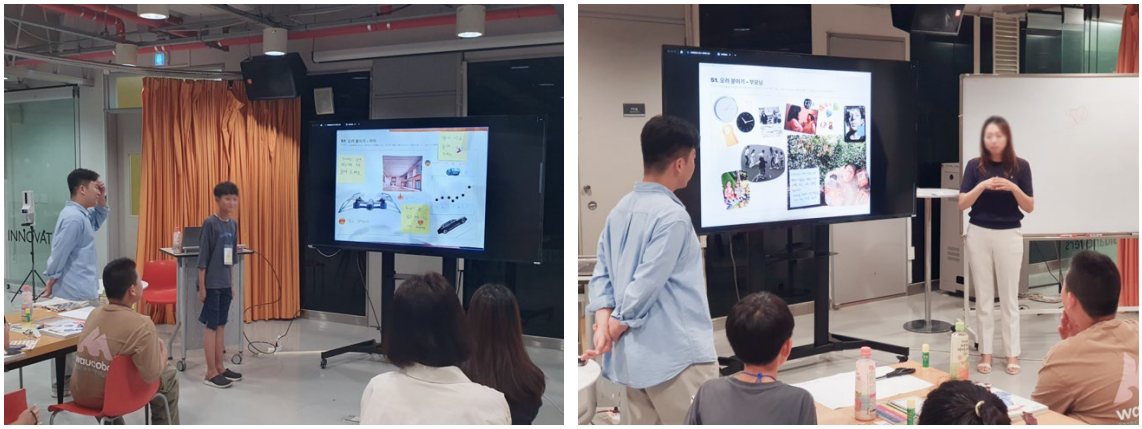


Figure 3. Sharing the Results of the Collage

3.5. Session 2. Co-creation Ideas

In the second session, parents and children were paired to sketch ideas. The parents were asked to let the children propose ideas first and discuss enhancing ideas at the beginning of the session to ensure that children's ideas were equally considered. Participants were prompted to choose from various forms of outcomes, including smartphone apps, IoT, product design, offline events, and negotiation & promises in order to encourage a variety of ideas. Family pairs selected insights from the collages of parents and children and placed them on workshop sheets. I requested the creation of mediation ideas that simultaneously satisfied the insights of both parents and children. Throughout the idea generation process, workshop moderators monitored the conversations between children and parents, intervening when the dialogue seemed to be leaning too heavily in one direction. Pencils, colored pencils, and emoji stickers were provided for sketching, and they were given 40 minutes for this session.

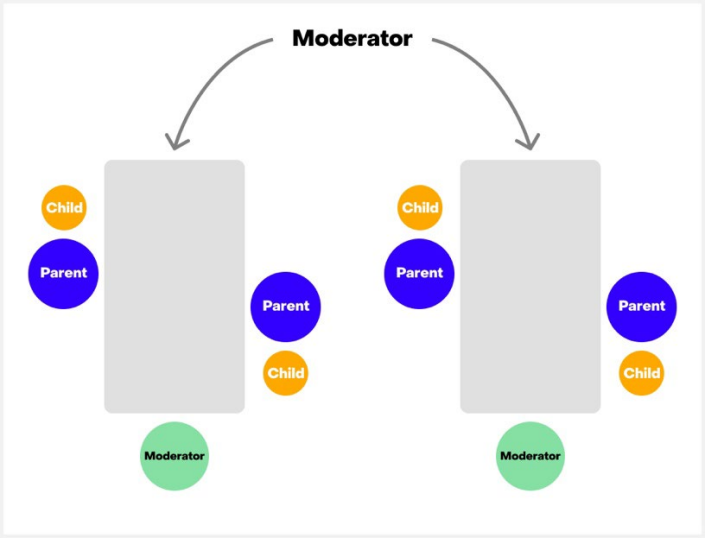


Figure 4. Participant arrangement for session 2

Figure 5. Session 2 by the Family Group

3.6. Session 3. Sharing Insights

Parents and children introduced their ideas as a team. During the presentation, paper and pens were provided to individuals to write their opinions on the ideas. Each presentation was limited to a maximum of 15 minutes, including sharing opinions from other participants. I collected comments from both parents and children after the presentations.

Figure 6. Idea Sharing

3.7. Data Analysis

The data for each session is sourced from the participants' produced outcomes, note-taking, and recordings. All sentences from the participants' workshop sessions were collected by separating them into units of meaning, and sentences not containing meaningful content related to the session were refined. A qualitative analysis was conducted based on a total of 383 data points, and the Affinity Diagramming method was carried out over three rounds to construct the Active Mediation Design Strategy. Subsequently, this was solidified through interdisciplinary literature research.

4. RESULTS

In this section, AM opportunities were identified from the shared experiences of both parents and children's groups about smartphone mediation during the collage process. Parents and children reflected on their mediation experiences through the collage and discussed improved mediation directions from each other's perspectives. The parent group asked their children for communication, parental role modeling, and family activities. In contrast, the child group proposed that parents get less angry and practice the same smartphone usage rules as they do. Both groups agreed that practicing proper smartphone use together would be effective. In this process, parents suggested that they could prevent children's smartphone addiction by engaging in other family activities such as reading and exercising. While parents mainly offered solutions to the problem, children primarily expressed the emotions and thoughts when they faced conflicts. This indicates not only the mediation process but also that parents' reactions to mediation can significantly influence children.

4.1. Collage Sharing Results

4.1.1. Parents Feeling Limited by Restrictions

During the collage session of the parent group, participants shared their respective experiences of RM at home. Even the parents who reported in the pre-survey that they did not use child management services mentioned setting smartphone use rules with their children and implementing sanctions when these rules were broken. Parents mainly created rules about smartphone usage time, but often encountered unexpected issues.

P5: My child has siblings, and they use the Nintendo together. Since they have fixed gaming times, I often saw them fighting over 'It's my turn!'. Then the child who couldn't play would say, 'Mom, I just want to use the smartphone.' so I allowed it.

The smartphone usage time varied for each child, but generally, they were allowed to use it for about an hour on weekdays. When parents used child management services, they set up usage times, and when

the child asked for more time, they added time in 10 to 15-minute increments. However, during this process, parents often reported that the restrictions caused inconvenience to even parents and cut off communication opportunities with their children. P4 and P6 expressed regret about the conflicts with their children arising from this. During the session, P6 suggested about his opinion related with AM.

P6: I think smartphone content or game developers probably research how to get people addicted. They make money when children play a lot, so we need to constantly tell our children why it's bad.

Parents said they turned to child management services due to a lack of family time. All participants said they send their children straight to after-school academies. In the pre-survey, parents reported spending an average of 3-4 hours with their children on weekdays, regretting the lack of conversation time due to school or academy assignments.

P2: We don't have much time on weekdays. I get home from work at 6, supervise my child's homework, and it's 8 by the time that's done. After bathing, it's 9, and it's bedtime for my child.

Some parents expressed concern that they seemed to be enforcing stricter limits over time.

P7: I think stricter limits on my child might have negative emotional impacts. Watching my child constantly and punishing them like 'Misery' exhausts me too.

While discussing, some parents reflected that they should set an example for their children instead of merely asking them to reduce smartphone use.

P6: From what I heard about our neighbor, they read books with their children. They said that reading together had a good effect. When parents lead by example, the child will say, 'I want to read too!' and follow.

The parent group discussed the limitations and contradictions of the RM they were using and shared ideas about AM, co-use, and improved RM. Based on their discussions, they completed their collage artwork.

The collage results from the parent group revealed various perspectives on active mediation, restrictive mediation, and co-use. The most frequently appearing image keyword was 'conversation with children.' They also highlighted the importance of family activities. For P4, while revealing guilt about monitoring their child, they expressed feelings and wishes that they couldn't convey to their child. The examples of parents' collage results are as below:

Figure 7. Example Images of Collage Results by Parents

4.1.2. Children difficult to communicate with their parents

A collage topic, "How can parents avoid conflicts when you use smartphones?" was given to the child group. Participants hesitated in creating their artwork. C1, C3, C4, C7 and C9 said they were afraid to ask their parents for anything. The researchers persuaded those who couldn't work due to fear to think of it as writing a letter to their parents, and then they gradually began crafting their pieces. They eventually created images that expressed experiences they had been scolded.

C3: Do we have to share this with our mothers?

C4: I'm afraid I might get scolded after the workshop.

Conversely, C2, C10, C11 struggled to start because they felt there was nothing they wanted to request from their parents. They believed they had a good agreement with their parents regarding smartphone use.

C10: I accept my parents' restrictions. My brother's phone recently had been confiscated because he did something wrong. I haven't had mine taken away yet. He did wrong, so he's paying the price.

Children's requests were simple: to be allowed more usage time, not to be shouted at, or not to be interfered with. They repeatedly expressed experiences where they were shocked or saddened by their parents' anger. C3 said the words from their parents hurt, and at those times, they felt so stunned that they couldn't say anything. C2, C5, C8 talked about ways they could make their parents happy and wished their parents would try not to get angry.

C5: Would my parents be happy if I made a daily plan?

C8: First, I'll improve my test scores so my mom can't nag. If that doesn't work, I'll give her gifts every day. If she still gets mad, I'll stand up for myself.

C5 and C9 expressed unfairness seeing their parents use smartphones extensively, while they faced restrictions.

C5: "My mom lies on the sofa all weekend looking at her phone."

C9: "Parents use their smartphones for a long time, but get angry when I do."

During the collage-making process, the children talked about their experiences, saying they hadn't been able to express these properly to their parents. Some said they didn't know what they wanted from their parents, making the collage activity difficult.

The child group expressed wishes to their parents to reduce anger and treat them fairly to avoid conflicts due to smartphone usage. Through their collages, they primarily conveyed the emotions they felt during their parents' mediation and the inconsistency in restrictions between them and their parents. While the parent group's results emphasized communication, the children's outputs indicated the difficulty of it. C7, C10, and C11 didn't express much in their artworks. In contrast, C9's artwork had numerous images and texts about parental restrictions and their feelings of injustice, since he thought that parents monitored and restricted his smartphone usage excessively. The examples of children's collage results are as below:

Figure 7. Example Images of Collage Results by Children

Participants summarized what they wanted to convey through their works and wrote it on post-it notes. Through collages created considering each other's viewpoints, they were primarily able to derive results emphasizing active and mild restrictive (rule-making) contents and efforts to persuade, convey, communicate, and request each other.

4.2. Active Mediation Design Strategy (AMDS)

The research results are presented in session 2 to address the study's RQ 1; “What is expected active mediation experiences compared with using traditional applications for smartphone usage, especially for both children aged 7-12 and their parents in South Korea?”. In this section, the experiences were expanded by discussing the co-designed ideas based on the indirect understanding of the participants' AM from the previous session. At last, I developed an active mediation design strategy (AMDS).

Parents and children picked up one opinion each written on post-its and designed a new mediation solution that satisfies them. Through this method, discussions on forming proper smartphone usage habits were naturally induced during the idea creation process, aiming to derive a service where AM was a primary consideration. Among the total of 15 outcomes, they created 5 AM ideas such as discussion, conversation, co-use which did not contain any concepts of RM. 4 of the ideas incorporated elements of AM along with making rules. The remaining 6 ideas were RM solution combined AM.

I extracted discussions on the participants' ideas from recorded data and structured an affinity diagram. Each coded sentence was semantically analyzed to group with similarity. Themes regarding AM desired by parents and children were derived from a total of 383 collected data after undergoing 3 rounds of categorizing. Through this analysis, I discovered 8 categories of active mediation.

The data within each category were grouped with similarity again, and then further classified to create sub-categories. As a result, a total of 17 sub-categories were identified. Each of these sub-categories represents a portion of the larger category, helping to refine the 8 active mediation categories. This outcome provided an answer the expected AM experience both children aged 7-12 and their parents in South Korea.

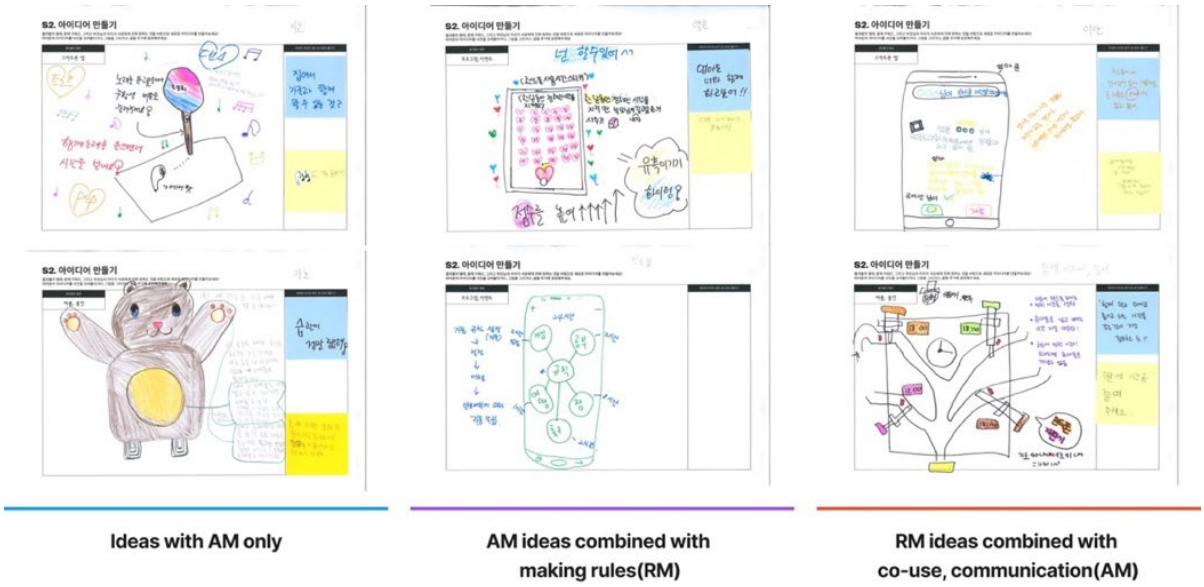


Figure 7. Example Images of co-created Ideas

Themes regarding AM desired by parents and children were derived from a total of 383 collected data after undergoing 3 rounds of categorizing. Through this analysis, the researchers discovered 8 categories of active mediation.

Table 2. Categories of Active Mediation Design Keywords

Category	Description
Collaboration	Co-use, activity, and sharing within the family.
Negotiation	Non-coercive communication between parents and children.
Expression	Expression of emotions and thoughts on smartphone mediation between parents and children.
Integrity	Trust between parents and children.
Bridge	Mediator or intermediary between parents and children.
Motivation	Parents' motivation of their children.
Child - Driven	Child's self-initiative.
Child - Centric	Opinions suggested from the child's perspective.

The data within each category were grouped with similarity again, and then further classified to create sub-categories. As a result, a total of 17 sub-categories were identified. Each of these sub-categories represents a portion of the larger category, refining the 8 active mediation categories. This outcome provided an answer the expected AM experiences both children aged 7-12 and their parents in South Korea.

Table 3. Active Mediation Design Strategy (AMDS) – 1

Category	Description	Comments
Collaboration		
Family Use	The family participates together in using the smartphone appropriately.	C10: If my family uses it together, I feel I would have more self-control over my phone usage. P10: I believe parents should make efforts like engaging in other activities with their children instead of getting angry.
Play together	The family engages in activities together, aside from smartphone usage.	C5: If my parents played with me, I'd look at my smartphone less. I mostly use it out of boredom. P10: At home, we have turned on fitness YouTube videos and exercised together instead of using our phones.
Sharing	The family freely shares each other's experiences and thoughts.	C7: It's good to understand each other's styles and be able to empathize. P9: I wish we had content to empathize together, like watching dramas with my child.
Negotiation		
Persuasion	Parents and children persuade each other about their wishes.	C3: If I'm told to study for 30 minutes, I'd include a feature to negotiate it down to 15 minutes. P5: I agree when my child asks for understanding to use the smartphone more while watching soccer.
Expression		
Child's Communication	Children can convey their thoughts about their parents' mediation methods.	C1: I was disgusted after hearing the story about how my parents controlled their own smartphones. P1: As the child grows, he becomes more perceptive and difficult to communicate with me.
Parent's Communication	Parents clearly convey their thoughts on mediation methods to their children.	P10: I mentioned that the problem seems to be more about the content recommended by algorithms on YouTube or the internet rather than the child's search itself.
Integrity		
Trust	Children discuss their trust in their parents.	C7: I feel good thinking that my mom knows where I am and what I'm doing. C10: I believe my mom will not forget to give me a sticker when I study and read.
Promise	Making a commitment about future smartphone use.	C2: If everyone promises to sleep at the right time, I think we won't be tired the next day. C5: When eating, I will only focus on the food.

Table 4. Active Mediation Design Strategy (AMDS) – 2

Category	Description	Comments
Bridge		
Indirect Communication	Children convey conflicts with their parents indirectly when it's hard to communicate directly.	C6: Before parents don't be angry, the child can sense it through telepathy feature in this idea. C9: It's good that we don't have to convey messages directly.
Things to mediate	Other means, apart from smartphones, play a mediating role between parents and children.	P5: Having someone from the family at home reduces the need to scold the child and helps in self-control. P6: Agrees with the statement that the presence of a spouse provides psychological comfort, leading to less anger.
Motivation		
Rewards	Rewards motivate children to adopt proper smartphone usage habits.	C1: If I study harder the day before, I might be able to play more games the next day. P7: Giving a reward that a child wants seems to be good for a sense of achievement and motivation.
Praise	Praise motivates children to adopt proper smartphone usage habits.	P1: Even if they don't keep promises, praise them so they don't give up. P2: It can boost the child's self-esteem and offer encouragement.
Child - Driven		
Awareness	Children are aware of the negative effects of smartphones.	P8: I think just the realization by the child of the negative aspects of smartphones is helpful. C5: If smartphones become monsters, children who use them a lot will probably be scared.
Self-determination	Children set their own smartphone usage plans and implement them.	P4: If they make their own plans, implement them, and receive rewards, it would help in mediation. C5: I made a timetable to keep the time I promised with my mom by myself.
Child - Centric		
Pestering	Both children and parents proposed a feature that allows children to continuously communicate their requests to their parents.	C3: It's a feature that allows me to pester my parents for permission to use a smartphone. P3: Through the pestering feature, families can share a bit of humor with each other.
Respecting Children	Children wanted their parents to understand their hobbies and thoughts more.	C3: I think it's better for kids not to see messages from friends they don't want to. C5: It's an idea where children fend off the smartphone monster with their favorite soccer.
Privacy Protection	Both parents and children felt that smartphone restriction features sometimes invaded the child's privacy.	C1: I felt my privacy was invaded due to inappropriate features. P4: I sometimes wonder if using monitoring features might be invading the child's privacy too much.

4.3. Design Opportunities and Challenges of AMDS

Parents and children reflected on their mediation experiences through generative sessions and discussed improved mediation directions from each other's perspectives. Afterward, parents and children formed teams to design an ideal mediation service and conducted discussions. The active mediation design strategy is the result of a qualitative analysis of the participants' shared opinions. In this section, design opportunities and challenges for the presented categories of the AMDS, and each is explained in detail in discussion. This provides an answer to RQ2.

Table 5. Design Opportunities and Challenges of AMDS

AM Category	Opportunities	Challenges
Collaboration	Common goals or parental role-modeling for social learning.	Presence of counter effects of co-use when service fails to facilitate conversation
Negotiation	Setting the context and criteria for negotiation proposals between parents and children	Difficulties if the motivation for negotiation is not met between parents and children
Expression	Facilitate parents and children to exchange feedback about mediation	Inducing simple, indirect, and intuitive expressions
Integrity	Supporting feedback that promotes conversation through restrained parental monitoring by service	Monitoring beyond the control of the service can accelerate distrust, the potential to replicate the disadvantages of restrictive services
Bridge	Various possibilities for bridging tools including creative ideas from the family	Preventing against loss of neutrality and purposefulness of the service
Motivation	Competition and cooperation within the family and with neighbors	Preventing for psychosocial side effects on children when connecting the service with other users
Child – Driven	Helping children to recognize the negative impact of smartphone use and set their action plans	Encouraging parents to participate not as enforcers but as protectors or observers for children
Child - Centric	Respecting autonomy and privacy, yet helping parents to protect in specific situations or aspects	Clearly distinguishing between the protection desired by children and the restrictive desires of the parents

5. DISCUSSION

In this study, it has been proposed how active mediation can be incorporated into child management service designs. AMEDS categories are explained in detail through various literatures including psychology, child studies, and digital parenting. This study's AMEDS is expected to contribute to generating a variety of ideas for AM service design. Accordingly, four idea examples are proposed by combining the category elements of AMEDS.

5.1. Detailed Explanation of AMDS

Collaboration

During the workshop, it was able to gather opinions from participants about setting and achieving smartphone usage goals with family members, and the need and usefulness of alternative activities to smartphone use. C10 suggested that features for family use could also aid in self-regulation, along with other participants' opinions, aligning with the RMT research which suggests that relational support positively influences motivation (Deci & Ryan, 1985; Ryan, 2000). The effectiveness of a family's common goals in relation to FamiLync has been proven through data collection (Ko et al., 2015). In the process of achieving common goals and forming role model relationship, parents sharing their commitments or activities with children induces the formation of positive habits through social learning (Bandura, 1978). Co-use has been accepted as a category of active mediation by many researchers(Livingstone & Helsper, 2008). However, facilitating conversation through media is key for co-use to be effective, and if parents and children do not engage in discussion but simply focus on one content might not be beneficial for smartphone or digital mediation.

Negotiation

In this workshop, 'Negotiation' is defined as non-coercive communication where a child's opinion is taken into account during parental mediation. As symbolically explained by C3, participants suggested a feature for negotiating smartphone usage time with parents. Conceptually, mediation is a crucial element of negotiation and parental mediation is considered a process of negotiation among family members on a specific topic(Carnevale & Pruitt, 1992, p.561). Negotiation between an adult and a child generates understandable outcomes and provides opportunities for children to receive feedback on their efforts (Oliver, 1998). However, there is a concern that ideal outcomes may not be achieved if either the parent or child has weak motivation for negotiation (Carnevale & Pruitt, 1992, p.539). Since parents' motivation to permit may be weaker compared to children's desire to use smartphones, proposing a negotiation feature for all mediating actions could pose problems. In fact, in the case of the 'ZEM' service, which has a similar function to negotiation, there are numerous reviews from children complaining about its uselessness compared to the providers who advertise the negotiation feature. Therefore, it is important to set the context and criteria for negotiation proposals. Additionally, designing the process of negotiation is as crucial as considering how to mediate and guide users in the outcomes of the negotiation.

Expression

The inner thoughts of participants were revealed in Session 1 regarding communication about parental mediation. Parents communicated with other parents and felt that their restrictions were sometimes excessive, yet natural, and expressed self-reflection towards their children. Children described their feelings of anger and sadness in situations of parental mediation, mentioning that their inability to express their thoughts to their parents at that time left them with emotional scars. Previous research has argued that restrictive services impose too broad limitations by controlling screen time rather than considering the child's way of using it (Modecki et al., 2022). In a family context, allowing a child to express their thoughts and feelings about parental mediation could reduce such unclear mediation by parents. Explaining the reasons for parental mediation to the child is a core concept of active intervention, and this alone can be effective in mediating the child (Dedkova & Smahel, 2020). Therefore, the design should facilitate parents and children to exchange feedback about mediation.

Integrity

One of the interesting opinions among the children was that they feel trust sometimes when their parents monitor their activities. Although monitoring is categorized as RM(Livingstone & Helsper, 2008), ideal monitoring based on respecting a child's autonomy can facilitate conversation, and this aligns with previous research findings (Rodríguez-Meirinhos et al., 2020). Erikson explained in his attachment theory that trust is formed from infancy and influences psychosocial functioning throughout life (Erikson, 1963). Properly formed attachment between parents and children is associated with the child's psychological stability (Armsden & Greenberg, 1987). In this regard, features or designs should be proposed that allow parents and children to form trust. Parental monitoring which does not induce excessive control can be one of the good suggestions.

Bridge

Children expressed a need for a 'Bridge' to convey their or their parents' words. As they desired to communicate with their parents about smartphone use through negotiation or expression, but they were worried about emotional conflicts. Interestingly, parents also felt the need for something to mediate their own reactions to be less angry with their children. Parenting through ICT should act as a 'Bridge' between parents and children. C6 suggested a creative idea of telepathy feature which can allow parents and children share their inner thoughts, and C8 proposed a teddy bear robot that mediates the relationship between parents and children. Therefore, mediation services should not only fulfill objectives but also act as mediators of emotions to form positive emotional bonds in the family(Livingstone, 2020).

Motivation

There are a lot of services that already have motivation features from rewards and praise and act as a hook to engage users. However, the psychosocial developmental process of children aged 7-12 (Michael G. Thompson, 2002) imply caution in the application of such features. Even considering the negative impacts of parental rewards or praise in peer groups might be an overstretch, it is necessary to consider the interactions between children and others when connecting the service to other family users.

Systematically organized competition and cooperation with other family groups can be an opportunity to make the service more effective and appealing.

Child-driven

The ability of children to recognize the negative effects of inappropriate smartphone usage and to set their action plans themselves in response is a key element of active mediation, and it can be seen as an ideal behavioral outcome (V. H. H. Chen & Chng, 2016). Therefore, the new services should enable children to self-reflect and provide feedback, while allowing parents to participate not as enforcers but as guardians or observers.

Child-Centric

The respect for children's autonomy and privacy has been a significant issue with existing restrictive mediation services. Services considered from the buyer's perspective have been biased towards parents in this regard. On the other hand, there were some desires for parental protection in specific situations or aspects. For example, there was a child’s need for their parents to block messages from friends they dislike as C3 mentioned Even parents reflect on their excessive restrictions at the same time. New services must clearly distinguish between what children want protection from their parents for and what constitutes excessive restriction.

5.2. Active Mediation Service Design Idea Proposals

The 8 elements of the AMEDS will be combined to clearly define a new form of active mediation service. Several possible combinations have been identified, and among these are some intriguing proposals. The anticipated direction of the outcomes is as follows.

Family Co-use is an Opportunity for New Mediation Services

The ideas for family co-use mentioned by the participants could be of interest to designers. They proposed ideas unrelated to direct smartphone usage, such as listening to music together or communication-assisting robots and they felt interesting. Parents reported that activities like exercising together or watching media allowed their child to put down their smartphones and engage in conversation, helping enhance their relationships. Co-use also respects a child's hobbies and thoughts, making it a Child-Centric solution. The current trend in the design of services for parents to manage their children's smartphone use shows a tendency to add new child-restrictive features or, even if initially proposed as Child-centered, to update the service in a restrictive direction according to parental demands. In the case of ZEM service, despite incorporating many child-friendly features like habit formation for the family, it still focuses on methods like 'setting study time' to reduce a child's smartphone usage, unable to break the vicious cycle of infringing on children's rights and damaging their social relationship with parents. Therefore, these ideas are significant as they offer solutions that go beyond the context of mere smartphone mediation and view the problem from a broader systemic perspective (Meadows, 2015). In this way, it is possible to propose a completely different form of design by observing the relationship between parents and children, stepping away from the conventional approach.

Role-modeling is an Appliable Feature for New Mediation Services

The discussion in the study demonstrated that challenges and competition among families and neighbors can be quite interesting. The workshop outcomes suggest that this concept extends beyond just the context of smartphone use, the potential for it to be applied to broader family activities and habit formation. Parents believed that being good role models for their children could play a positive role in cultivating healthy smartphone habits. Both children and parents argued that shared family smartphone usage fosters conversations and enhances mutual understanding. As a solution, they proposed engaging in the service on equal footing with the child, doing family activities together, or freely sharing daily experiences and thoughts, classified under the AMEDS's Collaboration. Prior research indicates that joint family usage can promote active mediation (Livingstone & Helsper, 2008)

FamiLync has proposed a leaderboard that encourages family members to set a common goal for smartphone usage time and supports each other in achieving it (Ko et al., 2015). This approach serves as an alternative to the restrictive mediation-based services in which one party assumes the role of

supervisor and the other, the supervised. Considering that what content is viewed on the smartphone is more crucial than the mere usage time, activities such as jointly watching educational videos, listening to audio books, and writing reflections are expected to be recommended. And it can be a motivating factor among all service users with viewing overall service perspective.

AM Service that Bridges and Facilitates Conversations

Children were more apprehensive about feedback from their parents directed at them than the mediation process itself. During the children's collage sessions, they wished their parents would restrain their anger. Children found it challenging to voice their requirements initially because they feared their parents' emotional outbursts. Some children said that while they accepted parental discipline because they trusted their parents' judgment, However, they also noted that sudden reprimands from their parents could startle them. On the contrary, parents identified the primary cause of conflict as the absence of communication with their children. During the co-design sessions, family groups suggested incorporating communication-enhancing features in various modes as a solution to this issue.

Within the AM design experience structure, a child's provision of their views on parental mediation methods and the parents clearly explaining their mediation intentions to the child was classified under 'Expression'. It also suggested that through 'Negotiation', parents could take in the child's proposal and accept or reject it, thereby cushioning any negative feedback in advance. Participants argued that consistent communication fosters the right integrity between parents and children, reducing conflicts and establishing proper smartphone usage habits for children. Existing child management services that prioritize family communication are still rare. Therefore, this study recommends including feedback on mediation, children's suggestions, or the process of parents persuading their child when designing child management services.

However, effectively guiding appropriate communication understanding within every context of parent-child conversations through a service presents a challenging task. Participants believed that their ideas could serve as a "Bridge" between parents and children. Some parents expressed that the presence of their spouse indirectly influenced them to be less confrontational with their children at home, and they hoped the service could play a "Bridge" role. Meanwhile, some children advocated for indirect communication, suggesting that it might be more effective for parents to express their frustration

indirectly, perhaps through a telepathy feature. Facilitating smooth communication between parents and children in conflict situations through the service is a challenge for the active mediation-based service design.

The Workshop as Active Mediation Itself

During the generative session, the parent group ruminated about the restrictive mediation they use at home, acknowledging that these might sometimes be excessive for their children. Additionally, in the co-design session, families pondered over the ideal mediation service while sharing opinions and creating unique outcomes reflecting their individuality. The evidence-based structure of the workshop encouraged discussions on what constitutes appropriate mediation strategies and proper smartphone habits at home expressing satisfaction by the participants. A week after the workshop ended, one parent expressed gratitude to me on the road, noting that their family's attitude and approach to their child's smartphone mediation had changed. This implies that the workshop itself was effective as active mediation, and it is believed that the structure and methods of the session can contribute to the design of active mediation services.

These examples are the starting point of the new active mediation service. The potential of these service proposals will be examined, and they will be materialized by such as designer workshops or participatory design processes. The materialized services will undergo prototyping implementation to verify if active mediation services demonstrate advantages in terms of children's autonomy and rights, social learning, and parent-child relationship aspects compared to existing services. Finally, it will be assessed whether active mediation services can be applied and are feasible in the real-world context of elementary school families in Korea, moving beyond theoretical foundations. Also, AMDS has the potential to expand beyond smartphone mediation to themes like addiction management at home, family communication and so on.

6. CONCLUSION

This study presents the requirements for AM to consider when designing child management services. Through co-design workshops involving both parents and children and combining theories from various fields into the design process, the AMEDS was made by categorized and refined experiences of active mediation that were not previously clearly structured. Prior research indicates that restrictive mediation, which predominantly adopts a controlling approach in existing child management services, might seem directly effective to parents as it blocks a child's media access. However, it could potentially increase media addiction (L. Chen & Shi, 2019). Apart from this, existing studies based on parental self-reporting and quantitative evaluations tend to consider less the emotional bond between parents and children, and they lack a deep understanding based on individual experiences. This research highlights such trends in child management service design and suggests the need for a service proposal based on active mediation. Through this study, designers can discover opportunities for new child management service proposals by understanding concrete knowledge of active mediation through participants' ideas and discussions.

7. LIMITATION

This study provides experiences and classifications to initiate active mediation service design, but it has several limitations. Firstly, all participants targeted primary school students and their parents in South Korea. Hence, the cultural background of Korean families could have influenced the classification of active mediation. Additionally, the relatively small sample size couldn't represent all experiences regarding parental mediation in households, thus limiting the generalization of the research findings. Most of the participants in this study exhibited characteristics typical of Korean families: dual-income households with mothers as the primary caregivers. This study didn't encompass diverse family structures. Future research should consider adding variables like family structure and lifestyle patterns to gather a broader range of experiences.

In this study, A specific design concept based on the research findings has not been proposed. Throughout the research process, I was able to find numerous mediation strategies related to research and a variety of services launched in the market continuously. I concluded that simply designing a service just combining active and restrictive mediations for good smartphone habits for children is not a solution to the many problems derived from the current situation, but just one of many alternatives. Therefore, I aim to propose, an active mediation service without parental restrictions through future research, observing the context of smartphone use by parents and children from a broader perspective. The 'relational bridge between parent and child', 'family co-use', and 'methods to facilitate conversations gained through workshops' obtained from this study will serve as the foundation for future service proposals.

8. FUTURE WORK

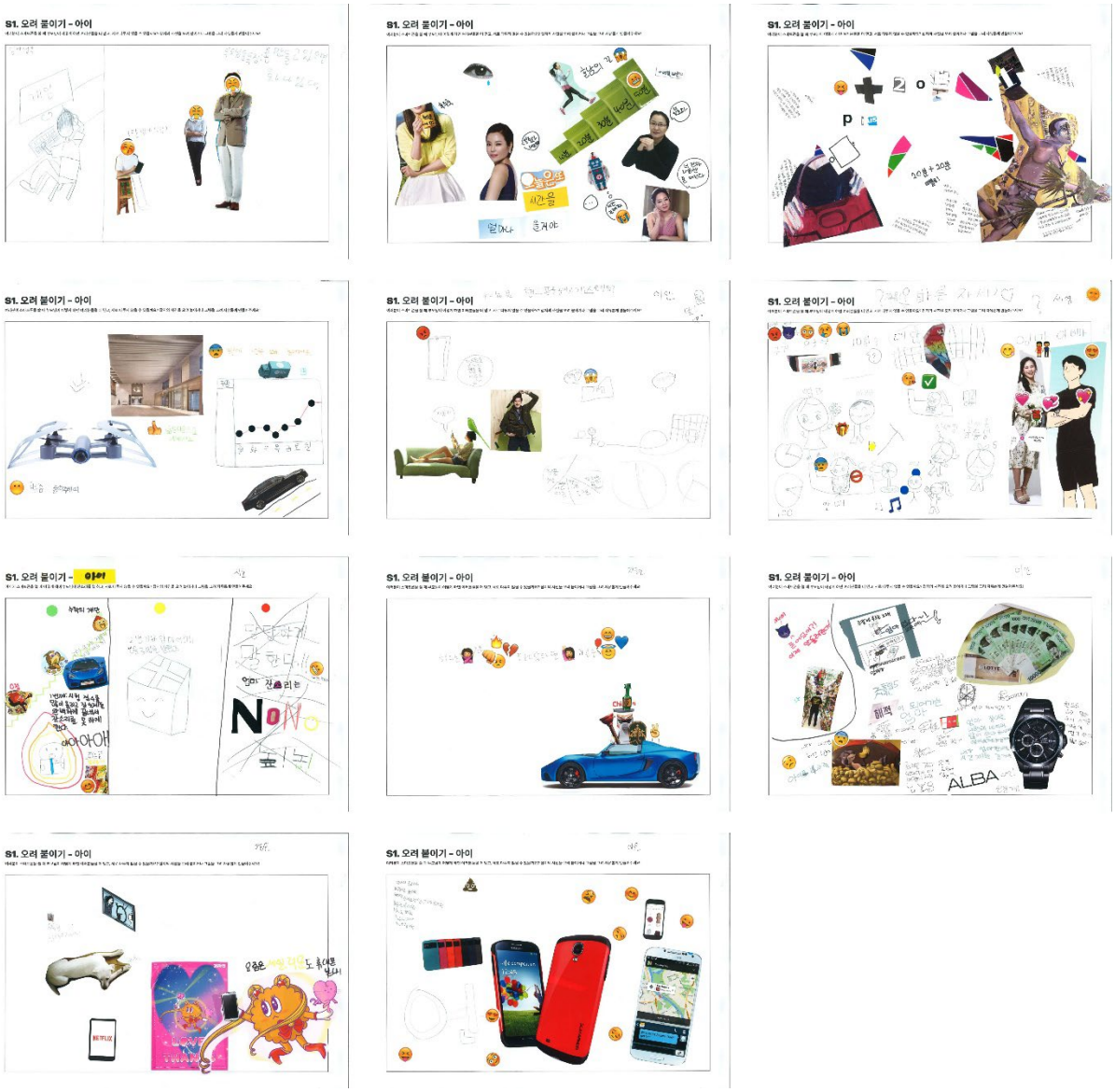
In further research, I propose a new IoT service design of active mediation-based service and suggest observing what differences arise in the context of smartphone use between parents and children compared to the existing restrictive intervention services.

In further research, I propose a new IoT service design of active mediation-based service and suggest observing what differences arise in the context of smartphone use between parents and children compared to the existing restrictive intervention services. It is non-sense to assume that digital services exclusively through smartphones will avoid restrictions on children's smartphone use by parents and encourage communication, and it is expected that there will be no significant difference from existing restrictive child management services or that the benefits of active mediation will not be fully utilized. On the other hand, tangible products like workshop toolkits are difficult to utilize the various data that

can be collected about family smartphone use, as smartphones are everyday products. Therefore, in future research, I intend to combine tangible interaction and experience from family use, and daily data collection through digital service. In the co-design ideation session of the workshop in the research, parents and children proposed various forms of creative IoT services. These proposals had novelty compared to existing intervention services.

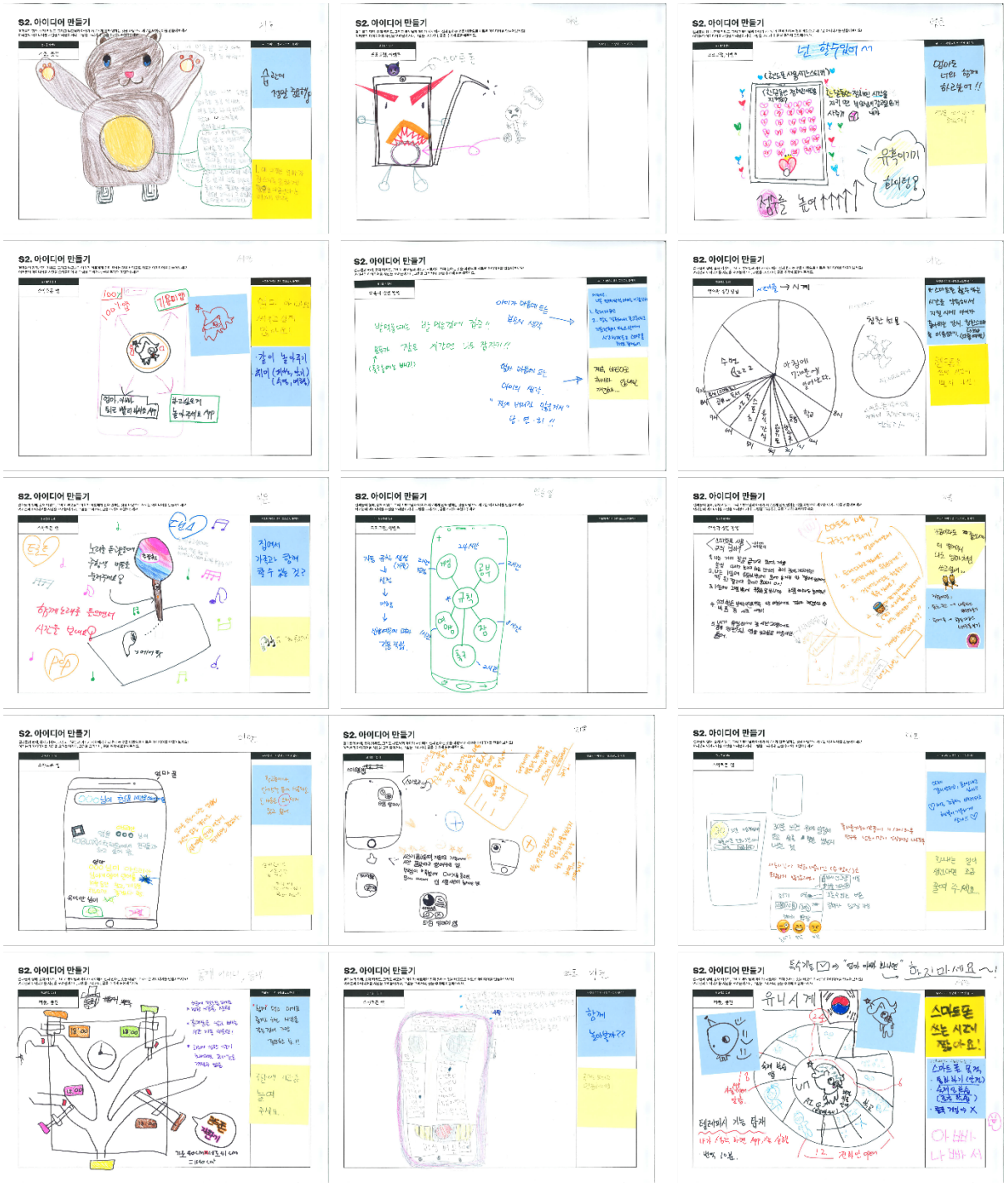
Hence, I will derive a design concept proposal based on the Active Mediation Design Strategy (AMDS) revealed in this study. As mentioned in the limitation, the current AMDS has developed through a demographic limitation as it analyzed only 9 families. To supplement the design structure, additional workshops should be planned. This will verify whether the 8 categories are consistently derived in the additional workshops and make revisions and supplements to propose a concrete AMDS. Finally, I plan to specify the target group for the service and conduct qualitative and quantitative research on design management through digital services.

Appendix



Appendix 1. Generative session results of children group

Appendix 2. Generative session results of parents group



Appendix 2. Codesign session results

References

Armsden, G. C., & Greenberg, M. T. (1987). The inventory of parent and peer attachment: Individual differences and their relationship to psychological well-being in adolescence. *Journal of Youth and Adolescence*, *16*(5), 427–454. https://doi.org/10.1007/BF02202939

Assor, A., Roth, G., & Deci, E. L. (2004). The Emotional Costs of Parents' Conditional Regard: A Self-Determination Theory Analysis. *Journal of Personality*, *72*(1), 47–88. https://doi.org/10.1111/j.0022-3506.2004.00256.x

Assor, A., & Tal, K. (2012). When parents' affection depends on child's achievement: Parental conditional positive regard, self-aggrandizement, shame and coping in adolescents. *Journal of Adolescence*, *35*(2), 249–260. https://doi.org/10.1016/j.adolescence.2011.10.004

Bandura, A. (1978). SELF-EFFICACY: TOWARD A UNIFYING THEORY OF BEHAVIORAL CHANGE*. In *Printed in Great Britain.Reprinted from thePsychologica/Review* (Vol. 1). Pergamon Press Ltd.

Batra, S. (2013). The Psychosocial Development of Children: Implications for Education and Society — Erik Erikson in Context. *Contemporary Education Dialogue*, *10*(2), 249–278. https://doi.org/10.1177/0973184913485014

Benrazavi, R., Teimouri, M., & Griffiths, M. D. (2015). Utility of Parental Mediation Model on Youth's Problematic Online Gaming. *International Journal of Mental Health and Addiction*, *13*(6), 712–727. https://doi.org/10.1007/s11469-015-9561-2

Bi, X., Yang, Y., Li, H., Wang, M., Zhang, W., & Deater-Deckard, K. (2018). Parenting styles and parent-adolescent relationships: The mediating roles of behavioral autonomy and parental authority. *Frontiers in Psychology*, *9*(NOV). https://doi.org/10.3389/fpsyg.2018.02187

Buijzen, M., & Valkenburg, P. M. (2005). Parental mediation of undesired advertising effects. *Journal of Broadcasting and Electronic Media*, *49*(2), 153–165. https://doi.org/10.1207/s15506878jobem4902_1

Carnevale, P. 1, & Pruitt, D. G. (1992). *NEGOTIATION AND MEDIATION*. www.annualreviews.org

Chassiakos, Y. R., Radesky, J., Christakis, D., Moreno, M. A., Cross, C., Hill, D., Ameenuddin, N., Hutchinson, J., Boyd, R., Mendelson, R., Smith, J., & Swanson, W. S. (2016). Children and adolescents and digital media. *Pediatrics*, *138*(5). https://doi.org/10.1542/peds.2016-2593

Chen, L., & Shi, J. (2019). Reducing Harm From Media: A Meta-Analysis of Parental Mediation. *Journalism*

and Mass Communication Quarterly, *96*(1), 173–193. https://doi.org/10.1177/1077699018754908

Chen, V. H. H., & Chng, G. S. (2016). Active and restrictive parental mediation over time: Effects on youths' self-regulatory competencies and impulsivity. *Computers and Education*, *98*, 206–212. https://doi.org/10.1016/j.compedu.2016.03.012

Chowdhury, A., & Bunt, A. (2023, April 19). Co-Designing with Early Adolescents: Understanding Perceptions of and Design Considerations for Tech-Based Mediation Strategies that Promote Technology Disengagement. *Conference on Human Factors in Computing Systems - Proceedings*. https://doi.org/10.1145/3544548.3581134

Chung, J. E., Choi, S. A., Kim, K. T., Yee, J., Kim, J. H., Seong, J. W., Seong, J. M., Kim, J. Y., Lee, K. E., & Gwak, H. S. (2018). Smartphone addiction risk and daytime sleepiness in Korean adolescents. *Journal of Paediatrics and Child Health*, *54*(7), 800–806. https://doi.org/10.1111/jpc.13901

Clark, L. S. (2011). Parental mediation theory for the digital age. In *Communication Theory* (Vol. 21, Issue 4, pp. 323–343). https://doi.org/10.1111/j.1468-2885.2011.01391.x

Curran, T., Hill, A. P., Madigan, D. J., & Stornæs, A. V. (2020). A test of social learning and parent socialization perspectives on the development of perfectionism. *Personality and Individual Differences*, *160*. https://doi.org/10.1016/j.paid.2020.109925

Danet, M. (2020). Parental Concerns about their School-aged Children's Use of Digital Devices. *Journal of Child and Family Studies*, *29*(10), 2890–2904. https://doi.org/10.1007/s10826-020-01760-y

Deci, E. L., & Ryan, R. M. (1985). *Conceptualizations of Intrinsic Motivation and Self-Determination*. https://api.semanticscholar.org/CorpusID:141160806

Dedkova, L., & Smahel, D. (2020). Online Parental Mediation: Associations of Family Members' Characteristics to Individual Engagement in Active Mediation and Monitoring. *Journal of Family Issues*, *41*(8), 1112–1136. https://doi.org/10.1177/0192513X19888255

Donald Norman. (2013). *Design of Everyday Things*.

Erikson, E. H. (1985). The life cycle completed: A review. In *The life cycle completed: A review.* W W Norton & Co.

Faugier, J., & Sargeant, M. (1997). Sampling hard to reach populations. *Journal of Advanced Nursing*, *26*(4), 790–797. https://doi.org/10.1046/j.1365-2648.1997.00371.x

Garg, R., & Sengupta, S. (2020, April 21). Conversational Technologies for In-home Learning: Using Co-Design to Understand Children's and Parents' Perspectives. *Conference on Human Factors in*

Computing Systems - Proceedings. https://doi.org/10.1145/3313831.3376631

Genc, Z. (2014). Parents' Perceptions about the Mobile Technology Use of Preschool Aged Children. *Procedia - Social and Behavioral Sciences*, *146*, 55–60. https://doi.org/10.1016/j.sbspro.2014.08.086

George, M. J., & Odgers, C. L. (2015). Seven Fears and the Science of How Mobile Technologies May Be Influencing Adolescents in the Digital Age. *Perspectives on Psychological Science*, *10*(6), 832–851. https://doi.org/10.1177/1745691615596788

Haddon, L., & Vincent, J. (2014). *European children and their carers' understanding of use, risks and safety issues relating to convergent mobile media. UK children's experience of smartphones and tablets: Perspectives from children, parents and teachers*. www.netchildrengomobile.eu

Haines, J. E., & Schutte, N. S. (2023). Parental conditional regard: A meta-analysis. In *Journal of Adolescence* (Vol. 95, Issue 2, pp. 195–223). John Wiley and Sons Inc. https://doi.org/10.1002/jad.12111

Harris, C., & Straker, L. (2000). Survey of physical ergonomics issues associated with school childrens' use of laptop computers. *International Journal of Industrial Ergonomics*, *26*(3), 337–346. https://doi.org/10.1016/S0169-8141(00)00009-3

Holtz, P., Appel, M., Kepler, J., & Linz, U. (n.d.). *Internet Use and Video Gaming Predict Problem Behavior in Early Adolescence*.

Hwang, Y., & Jeong, S. H. (2015). Predictors of Parental Mediation Regarding Children's Smartphone Use. *Cyberpsychology, Behavior, and Social Networking*, *18*(12), 737–743. https://doi.org/10.1089/cyber.2015.0286

Jiow, H. J., Lim, S. S., & Lin, J. (2017). Level Up! Refreshing Parental Mediation Theory for Our Digital Media Landscape. *Communication Theory*, *27*(3), 309–328. https://doi.org/10.1111/comt.12109

Joussemet, M., Landry, R., & Koestner, R. (2008). A self-determination theory perspective on parenting. *Canadian Psychology*, *49*(3), 194–200. https://doi.org/10.1037/a0012754

Kalmus, V., Blinka, L., & Ólafsson, K. (2015). Does it matter what mama says: Evaluating the role of parental mediation in european adolescents' excessive internet use. *Children and Society*, *29*(2), 122–133. https://doi.org/10.1111/chso.12020

Kim. (2019). *"Common Control" vs. "Human Rights Violation"... Controversy over 'Child Smartphone Control Apps' [What Do You Think?]*.

Kirwil, L. (2009). Parental Mediation Of Children's Internet Use In Different European Countries. *Journal of*

Children and Media, *3*(4), 394–409. https://doi.org/10.1080/17482790903233440

Kitamura, T., Shikai, N., Uji, M., Hiramura, H., Tanaka, N., & Shono, M. (2009). Intergenerational transmission of parenting style and personality: Direct influence or mediation? *Journal of Child and Family Studies*, *18*(5), 541–556. https://doi.org/10.1007/s10826-009-9256-z

Ko, M., Choi, S., Yang, S., Lee, J., & Lee, U. (2015). FamiLync: Facilitating participatory parental mediation of adolescents' smartphone Use. *UbiComp 2015 - Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing*, 867–878. https://doi.org/10.1145/2750858.2804283

Lanette, S., Chua, P. K., Hayes, G., & Mazmanian, M. (2018). How much is "Too Much"?: The role of a smartphone addiction narrative in individuals' experience of use. *Proceedings of the ACM on Human-Computer Interaction*, *2*(CSCW). https://doi.org/10.1145/3274370

Lauricella, A. R., Wartella, E., & Rideout, V. J. (2015). Young children's screen time: The complex role of parent and child factors. *Journal of Applied Developmental Psychology*, *36*, 11–17. https://doi.org/10.1016/j.appdev.2014.12.001

Law, D. M., Shapka, J. D., & Olson, B. F. (2010). To control or not to control? Parenting behaviours and adolescent online aggression. *Computers in Human Behavior*, *26*(6), 1651–1656. https://doi.org/10.1016/j.chb.2010.06.013

Lee. (2021). *Mediation for Parents of Elementary School Students' Media Usage(KR)*.

Lee, E. J., & Ogbolu, Y. (2018). Does Parental Control Work with Smartphone Addiction?: A Cross-Sectional Study of Children in South Korea. *Journal of Addictions Nursing*, *29*(2), 128–138. https://doi.org/10.1097/JAN.0000000000000222

Livingstone, S., & Helsper, E. J. (2008). Parental mediation of children's internet use. *Journal of Broadcasting and Electronic Media*, *52*(4), 581–599. https://doi.org/10.1080/08838150802437396

Livingstone, S., Ólafsson, K., Helsper, E. J., Lupiáñez-Villanueva, F., Veltri, G. A., & Folkvord, F. (2017). Maximizing Opportunities and Minimizing Risks for Children Online: The Role of Digital Skills in Emerging Strategies of Parental Mediation. *Journal of Communication*, *67*(1), 82–105. https://doi.org/10.1111/jcom.12277

Mascheroni, G., Livingstone, S., & Chaudron, S. (n.d.). *How parents of young children manage digital devices at home: the role of income, education and parental style Young children (0-8) and Digital technology View project*. http://eprints.lse.ac.uk/60513/

Mascheroni, G., Ponte, C., & Jorge, A. (2018). Digital Parenting. The Challenges for Families in the Digital Age (Yearbook 2018). In *Yearbook*. www.nordicom.gu.se/clearinghouse

Mathias, P. M., & Singh, K. (2023). Evolution In The Role Of Parental Mediation From Traditional Media To Digital Media Usage In Children: A Review Paper. In *Journal of Positive School Psychology* (Vol. 2023, Issue 1). http://journalppw.com

McNally, B., Kumar, P., Hordatt, C., Mauriello, M. L., Naik, S., Norooz, L., Shorter, A., Golub, E., & Druin, A. (2018). Co-designing mobile online safety applications with children. *Conference on Human Factors in Computing Systems - Proceedings*, *2018-April*. https://doi.org/10.1145/3173574.3174097

Meadows, D. H. (2015). *Thinking in Systems: A Primer*. Chelsea Green Publishing.

Michael G. Thompson, C. O. G. L. J. C. (2002). *Best Friends, Worst Enemies: Understanding the Social Lives of Children*, 어른들은 모르는 아이들의 숨겨진 삶, (2012), 양철북

Modecki, K. L., Goldberg, R. E., Wisniewski, P., & Orben, A. (2022). What Is Digital Parenting? A Systematic Review of Past Measurement and Blueprint for the Future. *Perspectives on Psychological Science*, *17*(6), 1673–1691. https://doi.org/10.1177/17456916211072458

MSIT. (2022). *The survey on smartphone overdependence*.

Naab, T. (n.d.). *From Media Trusteeship to Parental Mediation The Parental Development of Parental Mediation*.

Nathanson, A. I. (1999). *Identifying and Explaining the Relationship Between Parental Mediation and Children's Aggression*.

Oliver, R. (1998). Negotiation of meaning in child interactions. *Modern Language Journal*, *82*(3), 372–386. https://doi.org/10.1111/j.1540-4781.1998.tb01215.x

Rodríguez-Meirinhos, A., Vansteenkiste, M., Soenens, B., Oliva, A., Brenning, K., & Antolín-Suárez, L. (2020). When is Parental Monitoring Effective? A Person-centered Analysis of the Role of Autonomy-supportive and Psychologically Controlling Parenting in Referred and Non-referred Adolescents. *Journal of Youth and Adolescence*, *49*(1), 352–368. https://doi.org/10.1007/s10964-019-01151-7

Roth, G., Assor, A., Niemiec, C. P., Ryan, R. M., & Deci, E. L. (2009). The Emotional and Academic Consequences of Parental Conditional Regard: Comparing Conditional Positive Regard, Conditional Negative Regard, and Autonomy Support as Parenting Practices. *Developmental Psychology*, *45*(4), 1119–1142. https://doi.org/10.1037/a0015272

Ryan, R. M. and D. E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social

development, and well-being. *American Psychologist*, *55*, 1–68.

Samaha, M., & Hawi, N. S. (2016). Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Computers in Human Behavior*, *57*, 321–325. https://doi.org/10.1016/J.CHB.2015.12.045

Sanders, B. N. E., & Stappers, J. P. (2008, February 6). Co-creation and the New Landscapes of Design. *Codesign*. https://doi.org/10.1080/15710880701875068

Steen, M. (2013). Co-design as a process of joint inquiry and imagination. *Design Issues*, *29*(2), 16–28. https://doi.org/10.1162/DESI_a_00207

Subrahmanyam, K., & Greenfield, P. (2008). Online communication and adolescent relationships(49~58). In *Future of Children* (Vol. 18, Issue 1, pp. 119–146). https://doi.org/10.1353/foc.0.0006

Visser, F. S., Stappers, P. J., van der Lugt, R., & Sanders, E. B.-N. (2005). Contextmapping: experiences from practice. *CoDesign*, *1*(2), 119–149. https://doi.org/10.1080/15710880500135987

Walker, S., & Rudi, J. (2014). Parenting Across the Social Ecology Facilitated by Information and Communications Technology: Implications for Research and Educational Design. *Journal of Human Sciences and Extension*. https://doi.org/10.54718/tzan3058

Warren, J. L., Antle, A. N., Kitson, A., & Davoodi, A. (2023). A codesign study exploring needs, strategies, and opportunities for digital health platforms to address pandemic-related impacts on children and families. *International Journal of Child-Computer Interaction*, *37*. https://doi.org/10.1016/j.ijcci.2023.100596

Warren, R., & Aloia, L. (2019). Parenting Style, Parental Stress, and Mediation of Children's Media Use. *Western Journal of Communication*, *83*(4), 483–500. https://doi.org/10.1080/10570314.2019.1582087

Xie, X., Chen, W., Zhu, X., & He, D. (2019). Parents' phubbing increases Adolescents' Mobile phone addiction: Roles of parent-child attachment, deviant peers, and gender. *Children and Youth Services Review*, *105*. https://doi.org/10.1016/j.childyouth.2019.104426

Yip, J. C., Clegg, T., Ahn, J., Uchidiuno, J. O., Bonsignore, E., Beck, A., Pauw, D., & Mills, K. (2016). The evolution of engagements and social bonds during child-parent co-design. *Conference on Human Factors in Computing Systems - Proceedings*, 3607–3619. https://doi.org/10.1145/2858036.2858380

Young, R., & Tully, M. (2022). Autonomy vs. Control: Associations among Parental Mediation, Perceived Parenting Styles, and U. S. Adolescents' Risky Online Experiences. *Cyberpsychology*, *16*(2). https://doi.org/10.5817/CP2022-2-5

Zhang, F., Broz, F., Dertien, E., Kousi, N., Van Gurp, J. A. M., Ferrari, O. I., Malagon, I., & Barakova, E. I. (2022). Understanding Design Preferences for Robots for Pain Management: A Co-Design Study. *ACM/IEEE International Conference on Human-Robot Interaction*, *2022-March*, 1124–1129. https://doi.org/10.1109/HRI53351.2022.9889542

ACKWOLEDGEMENTS

The two years have been passed so fast. I would like to express my huge gratitude to everyone who supported and helped me during my master's program, letting me to move forward and stand up when I was frustrated. First, I sincerely thank Prof. Hwang Kim, who provided significant assistance not only in research but also in all aspects of campus life. I'm sure I can grow up much thanks to your heartfelt advice. Also, I extend my gratitude to Prof. Cha-Joong Kim, who generously shared advice on thesis writing and experiments. I am grateful to Prof. Hong-Yeol Eom, who responded to sudden committee requests. Prof. James Self and Prof. Kyung-Ho Lee provided great direction when my research was in hardship. Also I want to thank my colleagues who greatly contributed to my graduation thesis. First, I express my thanks to Han-Sol Kim, who is my good friend since I was undergraduate student. Whenever my research was at a standstill, Han-Sol Kim was the first colleague I turned to. I am also grateful to Sung-Jun Kim, Sung-Beom Kim, and Hyun-Wook Nam, who were passionate in their research support, even though we often indulged in frivolous fun. I deeply appreciate my OND colleagues who made going to school enjoyable every day and those who performed well as co-facilitators in ensuring the smooth progress of workshops. And last, I want to thank the participant families who enthusiastically participated in the workshops as if the research was their own topic.

The experiment in this research has been granted by NTC. Thanks to their help and support, my two-year journey has come to a proud and satisfying conclusion.