Supporting Communication and Well-being with a Multi-Stakeholder Mobile App: Lessons Learned from a Field Study with ADHD Children and their Caregivers

EVROPI STEFANIDI, University of Bremen, Germany and TU Wien, Austria
NADINE WAGENER, University of Bremen, Germany and Sensorimotor Interaction, Max Planck Institute for Informatics, Germany
IOANNIS CHATZAKIS, Institute of Computer Science, Foundation for Research and Technology - Hellas (FORTH), Greece
PAWEŁ W. WOŹNIAK, TU Wien, Austria
STAVROULA NTOA, Institute of Computer Science, Foundation for Research and Technology - Hellas (FORTH), Greece
GEORGE MARGETIS, Institute of Computer Science, Foundation for Research and Technology - Hellas (FORTH), Greece
YVONNE ROGERS, UCLIC, University College London, United Kingdom
JASMIN NIESS, University of Oslo, Norway

Children with attention deficit hyperactivity disorder (ADHD) and their caregivers face daily challenges which can adversely affect their well-being, especially regarding communication within their care ecosystems, comprising family, friends, educators, and therapists. To foster communication among children and their care ecosystem and support their well-being, we created REMEMO, a mobile app that was iteratively designed and evaluated by actively involving ADHD children and their caregivers. REMEMO supports both individual and collaborative use, offering tailored features for different user groups: children, parents, or therapists and educators. Its primary function is to enable users to record their experiences and emotions and choose whether to share these with other members of the care ecosystem. We deployed REMEMO in a multi-week field study with five groups encompassing ADHD children (total participants $n = 18$). Our analysis showed that REMEMO can support emotional expression, regulation, reflection, transparent and affectionate communication, as well as therapeutic practices, addressing needs of both ADHD children and their caregivers. Our findings also highlight the critical role of mutual understanding regarding technology use and contextual challenges in shaping usage patterns. We discuss opportunities and challenges in designing technologies that cater to the varying needs of different stakeholders of ADHD children's care ecosystems and engage in critical reflection regarding evaluating technologies with vulnerable populations, such as families of ADHD children.

Authors' Contact Information: Evropi Stefanidi, evropi.stefanidi@tuwien.ac.at, University of Bremen, Bremen, Germany and TU Wien, Vienna, Austria; Nadine Wagener, nwagener@mpi-inf.mpg.de, University of Bremen, Bremen, Germany and Sensorimotor Interaction, Max Planck Institute for Informatics, Saarbrücken, Germany; Ioannis Chatzakis, johnhatz@ics.forth.gr, Institute of Computer Science, Foundation for Research and Technology - Hellas (FORTH), Heraklion, Crete, Greece; Paweł W. Woźniak, pawel.wozniak@tuwien.ac.at, TU Wien, Vienna, Austria; Stavroula Ntoa, stant@ics.forth.gr, Institute of Computer Science, Foundation for Research and Technology - Hellas (FORTH), Heraklion, Crete, Greece; George Margetis, gmarget@ics.forth.gr, Institute of Computer Science, Foundation for Research and Technology - Hellas (FORTH), Heraklion, Crete, Greece; Yvonne Rogers, y.rogers@ucl.ac.uk, UCLIC, University College London, London, United Kingdom; Jasmin Niess, jasminni@uio.no, University of Oslo, Oslo, Norway.

ACM 2573-0142/2025/4-ARTCSCW177
https://doi.org/10.1145/3711075

CCS Concepts: • **Human-centered computing → Human computer interaction (HCI)**; **Interactive systems and tools**; **User studies**.

Additional Key Words and Phrases: ADHD, neurodiversity, children, families, emotion regulation, reflection, empowerment, well-being, family informatics, care ecosystem, longitudinal study, field study

ACM Reference Format:
Evropi Stefanidi, Nadine Wagener, Ioannis Chatzakis, Paweł W. Woźniak, Stavroula Ntoa, George Margetis, Yvonne Rogers, and Jasmin Niess. 2025. Supporting Communication and Well-being with a Multi-Stakeholder Mobile App: Lessons Learned from a Field Study with ADHD Children and their Caregivers. *Proc. ACM Hum.-Comput. Interact.* 9, 2, Article CSCW177 (April 2025), 37 pages. https://doi.org/10.1145/3711075

1 Introduction

Communication and mutual understanding are vital components of healthy interpersonal relationships and well-being, particularly in the context of children's care ecosystems [13, 29, 44, 82, 87]. These ecosystems, encompassing people involved in children's everyday experiences such as family, friends, educators, and potential therapists [78], strongly influence the quality of life, social activity, and success in school environments and can offer motivational and emotional scaffolding [19, 31, 53]. Transparent communication and shared understanding among care ecosystem stakeholders is of particular importance, especially for neurodivergent children, such as those with attention deficit hyperactivity disorder (ADHD) [60, 79]. ADHD is recognised as the most common neurodevelopmental diagnosis in children [23, 61, 89], and those with ADHD may exhibit variations in attention, activity level, and impulse control when compared to peers of the same age [21]. As a result, families of ADHD children often experience added stress and family frustrations [83], which can increase communication barriers [60, 79]. These challenges are often underscored by ADHD's high heritability [26], making it likely that parents of ADHD children need to regulate themselves besides supporting the regulation of their children. This can become particularly challenging since ADHD individuals often struggle with self-regulation and with emotion-regulation [6, 57, 68]. Difficulties in emotion regulation can hinder children's ability to express and share their feelings, potentially affecting their peer relationships and communication with caregivers [16, 25, 38, 39]. Additionally, discrepancies in approaches and motivations between families and therapists can result in unclear goals and a lack of shared understanding [60, 79], which can further complicate care coordination and lead to adverse outcomes for both children with ADHD and their care ecosystem [79]. Therefore, it is important to design solutions that help bridge these communication gaps in order to foster mutual understanding within the care ecosystem [60, 79]. As indicated by previous research, this approach can empower children, promote their sense of being understood, and support their independence [79].

Communication, information sharing, and tracking for family relationships and well-being are a recurring theme in family informatics research in the fields of Computer-Supported Collaborative Work (CSCW) and Human-Computer Interaction (HCI) [46–48, 56, 59, 69, 88]. A variety of pertinent work has focused on clinical settings, e.g. technology use during children's hospitalisation [47, 48]. Beyond clinical settings, and more specifically focusing on ADHD families, recent work [70, 80] has underscored the need for technologies to afford both individual and collaborative use by ADHD children and their families, to allow for co-regulation while fostering children's agency. Our work builds on prior research that seeks to support ADHD children and their caregivers beyond (only) clinical settings [70, 79]. In particular, we explore the design of technologies that support the communication and well-being of ADHD children and their care ecosystem across different contexts (e.g. home, therapy, school).

Concurrently, recent research has highlighted the need to design with neurodivergent interests in mind [75, 76, 79]. While the development of such artefacts remains under-explored, past work

suggests ways in which technologies could both be desirable for children and support the broader care ecosystem by addressing common difficulties. For instance, research argues for the active involvement of ADHD children and their care ecosystems throughout the design, development, and evaluation phases of technologies [78], and for designing technologies that do not solely focus on symptoms but also incorporate ludic aspects [75, 78, 79].

However, the practical integration of such technologies in real-life contexts remains a question. This includes their adoption and use not only by children with ADHD and their families but also by their broader network of caregivers, including therapists and other professionals. Research in this area could provide new insights into how such multi-stakeholder technologies are used and their impact on users' well-being. Therefore, in this work, we seek to answer the following research questions (RQs):

RQ1: How can technologies for ADHD children and their care ecosystems be designed to cater to their varying needs and interests and afford both individual and collaborative use?

RQ2: How does the integration of a multi-stakeholder digital tool within the care ecosystem of ADHD children affect their communication, everyday interactions, and overall well-being?

Building on our prior conceptual work [79] and design implications by Silva et al. [70], we iteratively designed, evaluated, and developed REMEMO, a multi-stakeholder mobile application, by actively involving ADHD children and their care ecosystem throughout the process. REMEMO adapts, providing a tailored user interface, based on whether the user is a child, a parent, or a professional caregiver (therapist or educator). Users can create, keep private, or share within their care ecosystem entries ("posts") about their experiences and emotions. They can also view, provide feedback, and react to their own and others' posts. We deployed REMEMO in a long-term field study, with five groups encompassing ADHD children (total number of participants $n = 18$, from which seven were children). The groups varied in composition, similar to how children's care ecosystems are comprised of different members in real life. The groups used REMEMO for four to six weeks (shortest 31 days, longest 44 days). In this work, we report on our findings from the app's deployment. Our findings showcase diverse usage patterns among different groups and participants. Overall, by facilitating the free expression of experiences and emotions and enabling autonomous sharing within their care ecosystem, REMEMO can support ADHD children and their caregivers while being perceived as fun. Our research contributes the following:

- The iterative and formative design and evaluation of a multi-stakeholder app that can be used both individually and collaboratively by ADHD children and their care ecosystems.
- Findings stemming from a multi-week field deployment with ADHD children and their care ecosystems regarding the impact of the app on users' reflection, emotional identification and expression, its influence on therapeutic practices, and identified tensions.
- Opportunities and challenges for designing technologies that seek to address the varying needs of ADHD children and their care ecosystem and research with vulnerable populations.

2 Background & Related Work

This section presents relevant background and previous work on technologies designed for ADHD children and their care ecosystem. We then engage with prior literature in family informatics and discuss technologies that focus on family interactions and communication in general.

2.1 Technological Support for ADHD Children and their Care Ecosystem

Various technologies have been designed to support children with ADHD and their care ecosystem, including mobile and tablet applications [54, 70, 74], smartwatches and wearables [20, 24, 70], and tangible systems [72, 84, 90, 91]. The majority of related work in this field has focused on supporting

either children with ADHD or ADHD children together with their families. As an example of the first, TangiPlan [84, 90, 91] is a system of tangible connected objects, representing tasks to be performed and providing assistance by structuring ADHD children's activities, with the overall goal to improve their executive functioning. Prominent examples of technologies supporting children with ADHD together with their families include ParentGuardian [54], a mobile and tablet system that monitors the stress of parents of children with ADHD, to deliver reminders of behavioural strategies to follow, both for moments of duress as well as for anytime reflective strategies. Similarly, MOBERO [74] was developed as a smartphone-based system that seeks to support families in establishing healthy routines, focusing on morning and bedtime routines. The aim was to assist children with ADHD to become more independent and to lower parents' frustration levels. While the above systems focused explicitly on the home context, CoolTaco [70] is a smartwatch and smartphone system that aims to support ADHD children and their families to collaborate in creating tasks, gain points for achieving them, and allow children to redeem rewards. Due to its inherent portable nature, it enables them to self- and co-regulate across multiple contexts (e.g. at school and home). These systems were evaluated with their target users, i.e. ADHD children and their families, and were found to have positive effects on the ADHD-related aspects that they sought to address, e.g. improved organisation and time management [91], help with providing pervasive regulation support to children [70], and supporting parents in implementing behavioural therapy strategies in times of need [54].

However, none of the developed technologies so far enable both individual and collaborative use, of not just ADHD children and their families, but also their therapists and educators. Moreover, despite the growing discourse advocating for the design of technologies that extend beyond solely addressing ADHD-related challenges [75, 76, 78, 80], there remains a need for actually implementing such technological artefacts and studying the impact of embedding them with ADHD children and their care ecosystems in real life contexts. Our work aims to address these aforementioned gaps.

2.2 Family Informatics

Family informatics investigates how families collaboratively manage and track their health through technology, with a growing body of work dedicated to tracking family health data and supporting overall family health [56].

For instance, research has explored how collaborative technologies can enhance or support family care coordination. Nikkhah et al. [47] researched how collaborative technology could augment family care collaboration and resilience during children's hospitalisation [47], by looking into augmenting social support in caregiving teams [48]. They highlighted that technology designs should be customisable and adaptable to accommodate different caregiver needs and should help increase connection and intimacy and provide shared experiences. Richards et al. [59] described how family care coordination depends on the ability to develop a shared understanding of care goals and progress, identifying barriers to it: differences in approaches and motivations, inability to rely on documentation, and information loss during transfer across the care team. They proposed building relationships across boundaries and communicating actionable information as mechanisms to overcome these barriers. Yamashita et al. [88] found that allowing caregivers to selectively share tracked data about the health and mood of the care recipient with other family caregivers positively impacted the caregivers' emotional well-being. Slovak et al. [71] showed how technology-based, child-led, situated interventions could empower children and parents, through actionable support directly within their family life, in the context of emotion regulation. These works highlight the importance of actively involving both children and their families in the design of supportive technologies as well as the significance of empowerment, whether through child-led interventions or by providing users with flexibility in their use of technology. Our work builds upon these efforts

by engaging multiple stakeholders in design, with the goal of supporting the well-being of ADHD children and their care ecosystem.

Another key aspect of family informatics research is reflection, the process of introspection where individuals review and analyse their thoughts, emotions, and behaviours [30], which can benefit well-being [41]. As such, an increasing number of researchers have been exploring technology-mediated reflection and how to design for it [8, 9, 33]. Particularly regarding shared reflection of family members, dashboards have commonly been used to facilitate it, by allowing visualisation of data in families [55, 62, 63, 65]. Of particular relevance to our research are prior works that actively involved not only caregivers, but also children in the tracking process, and deployed their artefacts in the field with families. For instance, Pina et al. [55] deployed Dreamcatcher, a system that combined data from wrist-worn sleep sensors and self-reported mood of families using a shared tablet display with ten families between 15 and 50 days. They found that this approach allowed families to view and reflect on each other's sleep data, showing how collaboration within the family is supported by the children's active engagement in the process. They noted, however, that adults did not always wish to share their data with other family members. Another example focusing on collaborative reflection is the work by Saksono et al. [63], who deployed Spaceship Launch in a 3-week field study with 13 lower-income families. The system employed a shared interface for parents and children to monitor each other's physical activity data, using exergames to promote physical activity. Their findings showed how such technologies can represent mutual quality time activities for families, in this case, exercise, which could help them form stronger bonds. These systems [55, 63] are designed to deepen the family's insights regarding health-related behaviours, using information collected from fitness trackers.

Previous research has also shown that shared experiences facilitated by such technologies are beneficial for learning, jointly reflecting on behaviours, and making decisions to improve the family's overall health and well-being [22, 49]. However, they usually need family members to use them simultaneously and might not provide much support when family members are apart [70]. Aiming to address this last aspect and focusing on ADHD families, Silva et al. [70]'s CoolTaco supports both self- and co-regulation for ADHD children and their parents. The multi-month deployment of CoolTaco with ten families of ADHD children demonstrated how such a multi-device system can support children's reflection and regulation, even when parents are not present. However, the study also highlighted tensions in children's autonomy, as it could be diminished by high dependency on parents for specific parts of using the system. These studies underline not only the benefits of both children and their families being actively involved in tracking and managing their (health) data, including family-level reflection and collaboration, but also how future systems should allow adaptable degrees of independent and collaborative use, to fit diverse family needs.

Drawing from related research, our work encompasses the design, evaluation, and deployment of a mobile app that incorporates family informatics in both home and therapy settings. Tailored for families of ADHD children and their professional caregivers, we envision that the app serves as a flexible tool for children, parents, as well as therapists and educators, addressing opportunities identified in previous work by facilitating both independent and collaborative use and reflection.

2.3 Technologies Supporting Family Interactions & Communication

In addition to technologies that support family health management, tracking, and reflection, another strand of research relevant to our work is technologies that aim to support family interactions and communication. Shin et al. [69] explored how CSCW technologies can better support parent-child relationships, identifying the need to address discrepancies in expected communication. They found that technologies promoting transparency, affection, and trust, as well as enjoyable and age-appropriate shared content among parents and children, could help in addressing this challenge.

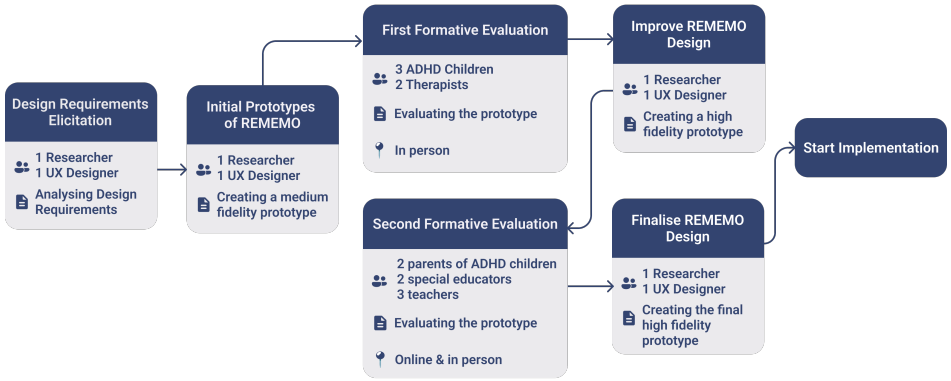

Fig. 1. Visualisation of the iterative design and evaluation process we followed for REMEMO.

Notably, they highlighted that families often struggled with what to communicate, and suggested that sharing events and experiences could fulfil the family's need to learn about each other's activities. This links directly to one of REMEMO's key functionalities, i.e. allowing ADHD children and their families to create entries in the system about their experiences and emotions, with the additional individual choice of whether to keep it private or share it with others.

Research in CSCW and HCI has explored the potential of interactive systems for recording and sharing personal experiences in daily life [7, 34, 43, 52, 81, 85]. These studies have collectively revealed that the exchange of family experiences and memories plays a vital role in fostering a sense of unity within families and in prompting discussions [34, 43]. However, the focus has predominantly been on parents documenting their children's lives, often with minimal participation from children in family communication. Using recorded memories as conversation starters from children's perspectives remains largely unexplored. We aim to address this by allowing both children and their care ecosystem to track and share their experiences. Shin et al. [69] also highlighted the effectiveness of conversation triggers in parent-child relationships through technology and suggested that future work should explore technology-mediated opportunities to reflect on family memories. Thus, our research investigates how a system that enables logging, sharing, and reflecting on shared content within the care ecosystem can impact communication and relationship building.

A number of CSCW and HCI studies on families have focused on supporting communication in remote settings, with most literature emphasising intergenerational communication and relationships [2, 11, 15, 18, 77]. For instance, Butzer et al. [15] developed Grandtotem, an asynchronous media-sharing device that aims to support intergenerational relationships between grandparents and their adult grandchildren studying abroad. Binda et al. [11] designed PhamilyHealth, a web-based photo-sharing system that allows family members to share health-related photos to encourage healthy lifestyles. While both systems show potential in supporting intergenerational relationships and communication, how those systems would impact families remains to be explored through field studies. This research extends existing work by exploring how communication and reflection can be facilitated through an in-situ inquiry, using a system that supports interaction both in-person (e.g. using the app together) and remotely (e.g. sharing posts while apart).

3 Iterative Design

As a first step in examining our research questions, we set out to design REMEMO, by following an iterative approach that actively involved ADHD children and their care ecosystem. Figure 1 shows the process we followed, which is detailed in the following subsections.

3.1 Design Requirements & Initial Prototypes of REMEMO

Based on our prior co-design and interview research with ADHD children and their care ecosystem [79], we compiled a list of initial design requirements. This prior work uncovered opportunities for simple and accessible technologies, such as mobile applications, that allow expression of and reflection on experiences and emotions to empower children with ADHD and their care ecosystem and remove communication barriers toward improving their overall well-being. In particular, we had identified emotional expression as a key aspect that is both driven by children's interests and is considered crucial by their caregivers, as it could foster empathy and even support emotion-regulation [79], which is an aspect that children with ADHD often struggle with [6, 45, 68]. Accordingly, an overarching requirement was that the app should be tailored to the needs and interests of the different ecosystem stakeholders. This implies that, depending on the stakeholder, the app might present different user interface (UI) elements or functionalities, while still enabling them to connect through the app and use it collaboratively. Therefore, we initially started designing the children's and therapists' UIs. The complete list of elicited design requirements, the rationale of which is based on our previous findings reported in Stefanidi et al. [79], can be found in the supplementary material. Three examples that illustrate the identified requirements are listed below, accompanied by the insights [79] on which they were based:

- **[child UI]:** The app should allow users to log positive experiences in the form of storytelling posts, to support recording, reflecting, and sharing of experiences and emotions, while at the same time ensuring the safety of even younger children by prompting them to reflect on positive aspects.
- **[therapist UI]:** The app should allow users to record posts about their interactions with a child, to allow not only children but also therapists to use the app, in line with the recommendations to facilitate both individual and collaborative technology usage.
- **[both UIs]:** Users should be able to choose whether to keep the posts for themselves or share them with other members of the ecosystem, to support their autonomy.

Based on the above, the first version of the children's and therapists' UI was designed together by the first author and a UX designer. Figure 5 presents some examples of this first iteration for the children's UI, and Figure 6 for the therapists' UI. These figures can be found in the Appendix.

3.2 First Formative Evaluation & Design Improvements

To evaluate the first version of REMEMO for children and therapists, we conducted a formative evaluation with three children with ADHD (one 10-year-old-girl with ADHD, one 10-year-old-girl with ADHD and high-functioning autism, and one 9-year-old boy with ADHD and high-functioning autism), and two of their therapists. Ethics approval was obtained from the Ethics Committee of the University of St. Gallen (HSG-EC-20230406) prior to the study, where one of the leading researchers was affiliated at the time the study was conducted. Participants were recruited by contacting ADHD professionals and treatment centres and through snowball sampling. All adult participants provided informed consent about their own and their children's participation prior to beginning the study. Additionally, children provided their assent for participation. Children received a small board game as a thank-you for their participation. The evaluations for the two groups (children and therapists) were conducted separately, at the therapist centre where the two participating therapists worked during the children's regular visits to the centre. One of the therapists was present while the evaluation with the three children took place, in order to facilitate their participation and ensure their comfort, in line with previous work that engaged ADHD children [79].

The three children participated in the evaluation together, sharing two smartphones, each with an interactive prototype of REMEMO loaded. This allowed them to interact with the app

both individually and collaboratively on the shared smartphone. The two therapists participated separately, using one smartphone at a time. In both cases, the study began with the researcher explaining the study and its purpose and asking if there were any questions. For the main part of the study, participants were given a scenario, which was read aloud step by step by the lead researcher. They were then asked to interact with the prototype to complete the steps. Following this, participants could interact with the app freely if they wished. In the end, short interviews were conducted, inquiring about the participants' experiences and feedback regarding the app, its design, and its functionality. The scenarios and the interview protocol (one for the children and one for the therapists) can be found in the supplementary material.

The participants' interactions with the smartphones were screen and audio-recorded, and the interviews were audio-recorded for later transcription and analysis. The first author transcribed and analysed the recordings together with the UX designer. The analysis led to an enhanced list of design requirements and considerations. The complete list of elicited design requirements from this phase can be found in the supplementary material. Two examples that illustrate the identified requirements are listed below. Based on this phase, the changes required to the children's UI were minimal, while the therapists' UI required significant changes.

- **[child UI]:** The Next and Back buttons should be more prominent, and especially for younger children, they should be available both at the top and bottom of the screen.
- **[therapist UI]:** The therapist-user should be able to select exactly which parts of the post they want to share with others. They should even be able to remove specific aspects of their post before sharing e.g. the logging of their own emotions.

Based on the insights of the first formative evaluation, the design of REMEMO was refined. Figure 7 shows some sample screens of the refined medium-fidelity prototype.

3.3 Second Formative Evaluation & Final Design

Following the refinement of REMEMO's design, we conducted a second formative evaluation that comprised parents, special educators, and teachers of ADHD children as participants, to complement the knowledge we had acquired based on the first formative evaluation. In particular, we conducted evaluation sessions with two parents of ADHD children (online), two special educators (online), and three school teachers (in person). Participants were recruited using the authors' extended social network and snowball sampling and gave their written informed consent to participate prior to the study. Given the first formative evaluation and prior work, we hypothesised that parents might wish for their UI to be similar to the one designed for the children, with some additional functionality, while (special) educators would prefer having the functionality available through the therapist's UI at their disposal. The evaluation sessions described below confirmed this assumption.

In both online and in-person sessions, participants interacted with an interactive prototype of the children's UI through a link to the prototype or a smartphone that had the prototype loaded, respectively. We purposefully did not show the therapists' UI to avoid biasing participants, but rather inquired about the various functionalities that were available in the therapists' UI later in the interviews. To begin, the experimenter introduced the study and briefly presented the work done so far, explaining the overall concept and the functionality that the children's and therapists' UI provided. Similar to the first formative evaluation, participants were provided with an interaction scenario and were asked to interact with the prototype of the children's UI to complete the steps. Participants were then able to interact with the app freely if they wished. At the end of the study, short interviews were conducted, inquiring about the participants' experiences and feedback. The scenarios and the interview protocol can be found in the supplementary material.

The participants' interactions with the smartphones were screen and audio-recorded, and the interviews were audio-recorded for later transcription and analysis. The first author transcribed and analysed the recordings together with the UX designer. The analysis of the evaluation sessions confirmed our assumption and resulted in three versions of the UI for REMEMO: one for children, one for parents (same basis as for the children, but with the additional functionality described in the next session), and one for therapists and (special) educators. The next section describes the final prototype and each of those three versions of REMEMO in detail. This final prototype met all the originally elicited design requirements.

4 REMEMO

Based on our iterative design process described in section 3, the final high-fidelity designs of REMEMO were created and used for implementing the system. We implemented REMEMO as a mobile application working on both smartphones and tablets, making it accessible to families with different devices at their disposal. REMEMO allows children and parents to log their experiences and emotions, reflect on them, and choose whether to share them with members of their care ecosystem. Similarly, it allows therapists and educators to perform the same regarding their experiences in relation to a child in their care ecosystem. We strove to allow for both individual and collaborative use of the app, so that while REMEMO can be used collaboratively, users are not dependent on others to use it, fostering both independence and collaboration [70]. Below, we describe each of the three UI adaptations of REMEMO: the UI for children, for parents, and for therapists/educators, while Table 1 summarises the features available to each user type. Videos demonstrating the use of the app from each of the three adaptations are available in the supplementary material.

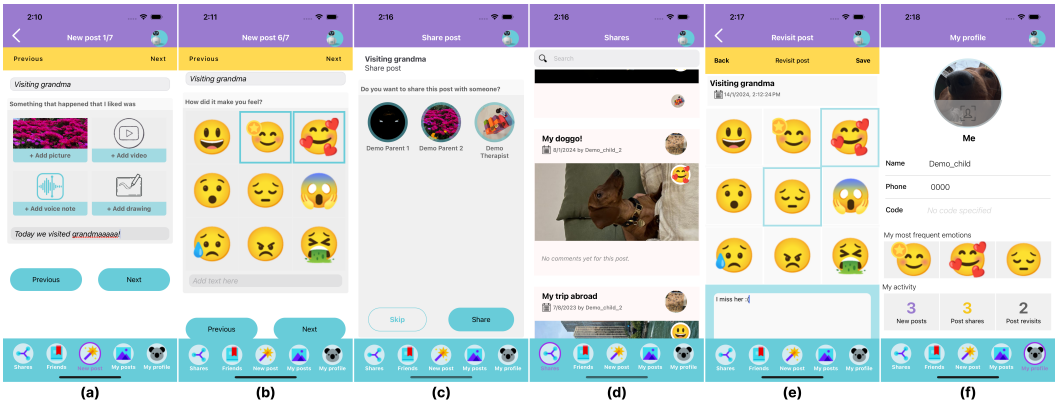

Fig. 2. Example screens from the children's UI. a) Different media options for completing the prompt "Something that happened that I liked was" including images, videos, voice recording, drawing and text, b) Emoji and text options to answer the question "How did it make you feel?", c) Sharing options, d) Posts that have been shared with the child, e) Revisiting a post by adding both text and emojis, f) The child's own profile.

4.1 REMEMO for Children

Children are able to navigate the app using a menu bar at the bottom of the screen (Figure 2). They can create a new post about their experiences under "New Post", using pictures, videos, voice notes, drawings, or text, guided by questions from REMEMO (Figure 2a). They can then select one or more emojis to express their emotions and optionally add some text (Figure 2b), and can choose to share their posts with their friends (Figure 2c). Under "Shares", they can see and interact with what others have shared using text and emojis (Figure 2d), and under "Friends" they can view

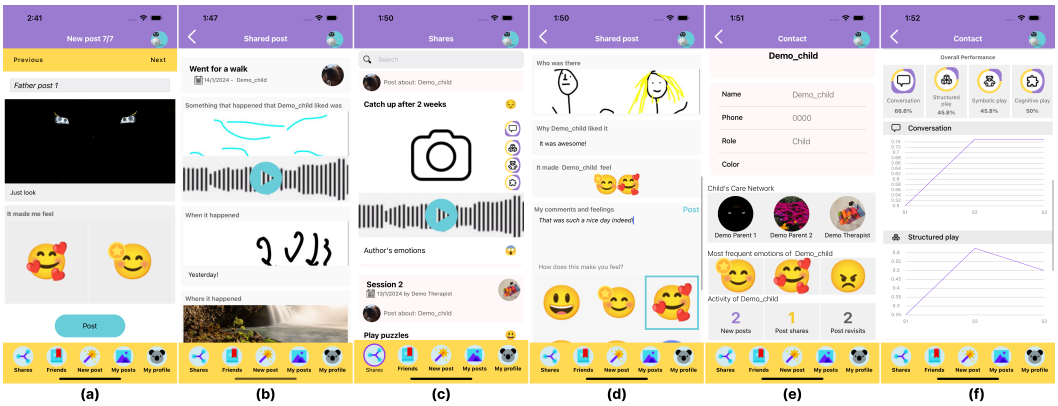

Fig. 3. Example screens from the parents' UI. a) Overview of the created post before saving it, b) Details of a shared post by another parent, c) Shared posts from a therapist and a parent with this parent, d) Commenting on a post someone shared, e) and f) Viewing the child's profile as a parent.

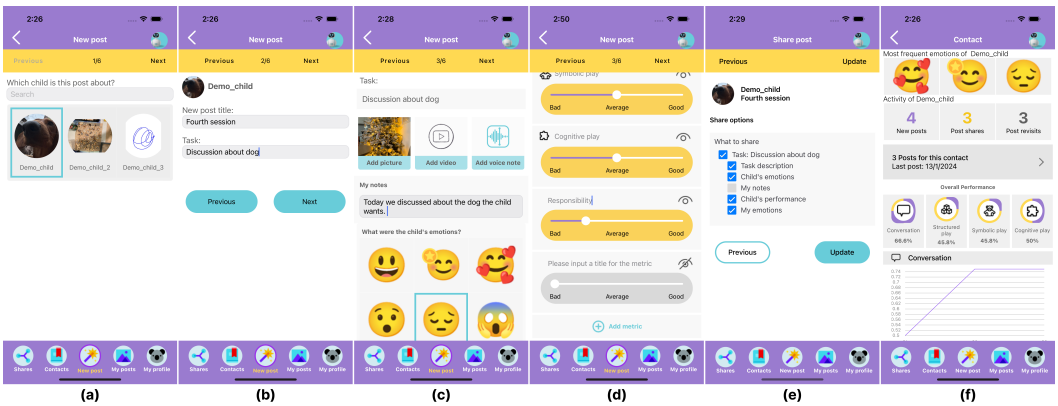

Fig. 4. Example screens from the professionals' UI. a) Selecting a child to make a post about, b) Naming the post and the first activity, c) Adding different media to describe the activity and the child's emotions, d) Adding a custom metric titled "Responsibility", e) Selecting which parts of the post to share, f) Viewing usage statistics and the performance of the child based on previous posts.

their friends in the app. By visiting "My Posts" they can view and revisit their own posts to update them with current thoughts and feelings (Figure 2e), while under "My Profile" they can access their profile and use information, such as their most frequently used emojis (Figure 2f).

4.2 REMEMO for Parents

Parents have access to all the functionalities available to children (Figure 3a-d) but with two additional features. First, they can view the child's care ecosystem in their profile (Figure 2e) as well as statistical reports about the child's use of the app, including reports from therapists regarding the child's performance on specific metrics (Figure 2f). Second, parents can receive posts shared by therapists, which is not the case for children. However, children *can* create and share posts with therapists. These additional features enable parents to have a comprehensive understanding of their child's progress and interactions within the app, facilitating better support and engagement.

Table 1. Feature availability for different user types in REMEMO

Feature	Children	Parents	Therapists/Educators
Create a post	**X**	**X**	**X**
Share a post	**X**	**X**	**X** (not to children)
Revisit own posts	**X**	**X**	
View & interact with shared posts	**X**	**X**	**X**
View friends/contacts	**X**	**X**	**X**
View own profile & use statistics	**X**	**X**	**X**
View use statistics of children in care ecosystem		**X**	**X**
Record child metrics			**X**
View child metrics		**X**	**X**

4.3 REMEMO for Therapists and Educators

Therapists and educators can use REMEMO to create posts about their work/sessions with children (Figure 4a), recording details of activities (Figure 4b) using different media (Figure 4c). They can also create and record child performance metrics using sliders and custom metrics (Figure 4d), and can share their posts with adults from the specific child's care ecosystem. Importantly, therapists and educators can select exactly which parts of the post they wish to share (Figure 4e). Overall, they have a comprehensive overview when visiting a child's profile (Figure 4f), including aggregated information about the child's use of REMEMO, quick access to all posts made about the child by themselves or other professionals, as well as statistics regarding the child's performance on various metrics. Therapists and educators can also note their own emotions during activities (Figure 4e). This was based on the wishes of therapist participants to not only use the app collaboratively, as a technology to support their care work of ADHD children, but also individually, as a self-recording tool, and to be able to express and reflect on their own emotions. This aligns directly with our overarching goal to provide opportunities for both individual and collaborative use.

4.4 Implementation

REMEMO is a mobile application based on the React Native framework [1], allowing for simultaneous development of both Android and iOS applications, which was necessary for this study where users' devices had not only different operating systems (Android and iOS), but also different versions of each. A back-end server hosted on our University's servers supported the mobile application and was responsible for storing and handling the data in a secure manner. The Strapi [2] headless Content Management System was selected and used for the system's backend, as this allowed quick data template definition and automatic API generation functionalities. The app is available in three languages: English, German, and Greek, with the ability to easily include additional languages via a translation table that matches words and phrases between languages.

5 Field Study

We deployed REMEMO in the field with five groups of participants, including children with ADHD, parents, siblings and therapists, adding up to $n = 18$ participants in total. Participants used the app in a longitudinal field study lasting 4 to 6 weeks (min: 31 days, max: 44 days, $SD = 5.03$), integrating it into their daily lives according to their personal preferences. We first conducted introductory

[1] https://reactnative.dev/
[2] https://strapi.io/

Table 2. Participants' data and summary of app usage (all values counted between 1st and 2nd session).

				Number of Posts						
ID	**Description**	**Age & Gender**	**Days**	**Made**	**Revisited**	**Shared**	**Deleted**	**Received**	**Comments**	**Usage Time**
AC1	Child with ADHD	12 | F	42	27	7	27	3	17	20	3 hours
AP1	Mother with ADHD	52 | F	42	17	7	11	1	23	23	6.5 hours
BC1	Child with ADHD	13 | F	42	7	1	7	0	4	6	37 mins
BP1	Mother	55 | F	42	2	0	1	0	4	1	33 mins
CC1	Child with ADHD and ASD	10 | M	44	1	0	1	1	1	5	38 mins
CC2	Child with ADHD and ASD	9 | F	44	1	3	0	1	2	2	1h 8 mins
CP1	Mother	32 | F	44	1	0	1	0	2	3	1h 30 mins
CT1	Psychologist for CC1 and CC2	29 | F	43	1	N/A	1	0	3	0	19 mins
CT2	Occupational therapist for CC2	25 | F	43	0	N/A	0	0	3	1	11 mins
CT3	Speech therapist for CC2	26 | F	43	2	N/A	2	0	1	1	43 mins
CT4/ **E**T1	Speech therapist for CC1 and EC1	39 | F	43	6	N/A	6	0	7	1	45 mins
DC1	Child with ADHD and ASD	9 | M	36	2	0	0	0	2	0	49 mins
DP1	Mother	42 | F	36	2	2	2	0	2	1	33 mins
DT1	Occupational therapist for DC1	28 | F	38	1	N/A	1	0	4	0	46 mins
DT2	Psychoeducator for DC1	35 | F	36	4	N/A	4	0	3	0	28 mins
EC1	Child with ADHD	8 | M	32	5	0	5	0	4	5	41 mins
EC2	Neurotypical sibling	11 | F	31	1	0	1	0	7	1	29 mins
EP1	Mother	35 | F	32	3	0	3	0	5	3	22 mins

sessions, followed by participants using the app for multiple weeks, and concluded the study with debriefing interviews. Participation in the sessions was either online or in person based on their preference and availability. The overall aim was to evaluate how REMEMO affects users (RQ_2), with a particular focus on communication, everyday interactions and well-being. The study received prior ethics approval from the Ethics Committee of the University of St. Gallen (HSG-EC-20230406). All adult participants provided informed consent about their own and their children's participation prior to beginning the study. Additionally, the children gave their verbal assent for participation.

5.1 Field Study Participants

We used our extended social network and snowball sampling to recruit participants. Additionally, we contacted a therapy centre in Greece, and information flyers were distributed in both cases. There was no overlap between the formative evaluation participants and the ones in the field study. Adult participants received remuneration of an equivalent of 150€, and children received a game or voucher equivalent to 20€. In total, $n = 18$ participants took part in the study, including ADHD children, their parents, and siblings and/or therapists, if applicable (parents: $M = 43$ years, $min : 35$, $max : 55$, children: $M = 10$ years, $min : 8$, $max : 13$, therapists: $M = 30$ years, $min : 25$, $max : 39$). Participants formed five groups based on the children's existing care ecosystem. Hence, group sizes ranged from two to seven participants per group. For more details, see Table 2.

The first letter of each participant's ID denotes their group (e.g. A, B, C). For the second letter, C stands for child, P for parent, and T for therapist. Notably, CT4/ET1 is the speech therapist of both CC1 and EC1, thus belonging to both groups. In order to keep the number of participants clear, we include her in Table 2 only once. Groups A and B resided in Germany, while groups C, D, and E in Greece. Each participating group was centred around a child (or children) with ADHD but varied in its composition, number of members and (social) backgrounds. The next section describes each group as this is essential information to understand their usage patterns of REMEMO. Groups C, D, and E included a therapist as the children in these groups were seeing a therapist at the time of the study. In contrast, groups A and B did not include one, as the children were not seeing one and our goal was to include the real-life care network for all participants. We also tried to recruit teachers, but we were not successful. This connects to the overall challenging task of recruiting vulnerable groups, such as ADHD children and their care ecosystem, made even more complex when multiple stakeholder groups are sought, as in our case. As an example, AP1 approached one of AC1's school teachers to participate in the study together with AC1, and while the teacher was initially positive, the school director declined the request, as they felt it would impose time requirements on an already busy schedule on their staff.

5.1.1 Contextual Information about the Groups. Here, we present short overviews of each participant group's members and their background stories, based on information the participants disclosed during the introductory interviews. The group descriptions were shared with the respective participants both in English and in their native language, and they had the opportunity to suggest changes. The children from Groups C, D, and E all attended a common therapy centre where the participating therapists were based and recruited. All participants used our app on their smartphones, apart from CC1 and EC1, who used it on their tablets.

Group A. Group A consists of two participants: a mother with ADHD (AP1) and a 12-year-old daughter with ADHD (AC1). The family also includes a father and three older brothers who did not participate in the study. AP1 is currently in therapy, while AC1 is not attending therapy sessions. AP1 and AC1 participated together with group B (based on their request) due to a close friendship between the parents and between the children, meaning that they were part of each other's ecosystem. AP1 demonstrates a propensity for self-reflection and effective and open communication. AP1 intensely experiences emotions but finds it sometimes challenging to identify and express them. She acknowledges difficulties in organising thoughts and prioritising tasks and recognises a tendency to be controlling and to intervene inappropriately in certain situations. AP1 is currently engaged in a "self-discovery and improvement" phase, optimistic about the potential benefits of REMEMO for enhancing communication with her daughter and demonstrating her interest in her daughter's life. AC1 is sometimes reflective of her thoughts and actions, with less emphasis on acknowledging emotional experiences. While she sometimes shares her experiences

with her family, she openly admits a reluctance to talk about her feelings, as she is "not that kind of person" (AC1), and apart from sometimes talking about how she feels with her mother, she in general "just doesn't want to" (AC1). In terms of technology usage, the family adheres to stringent screen time regulations. The younger children's devices are securely stored, accessible only during specific time windows and after informing the parents of their intended usage. In the case of AC1, due to an undisclosed past incident, she has limited access to her smartphone, with an exception made for the use of REMEMO.

Group B. Group B consists of two participants: a single mother (BP1) and her 12-year-old daughter with ADHD (BC1). BC1 was recently diagnosed, and the family struggled with finding the right strategies and medication. BP1 works multiple jobs and has a very demanding schedule. She puts value in spending quality time with her daughter, but her busy schedule does not always allow that. She is reflective and has a deep interest in understanding herself and her thoughts. BP1 has a support system in place, including a partner (living in a different household), family members and friends, and appears to overall be an optimistic person. She was very enthusiastic about doing the interview and to "have someone to talk to". She stated that she is currently looking for alternative methods to medication for ADHD and was partly hoping that REMEMO could be an alternative method to address some of the challenges they face in their everyday life. She was quite disappointed with how a doctor handled the case of her daughter, as he "was only looking at the bad stuff and saying what BC1's struggles are, and not at any of her strengths, and he was just very negative". BC1 is very privacy concerned. She pointed out that it is very important to her that her classmates do not find out that she has ADHD. BC1 is reflective and often thinks about her decisions and their impact. Regarding expression of feelings, she mostly confides in her mother and aunt, and often talks about her feelings after being prompted by her mother. Regarding technology use, BP1's screen time is high for work-related purposes and she only spends limited "leisure" time on her smartphone to communicate with friends and family. BP1 reported struggling with regulating BC1's screen time, which is high also due to the tablet they use for school-related matters. BP1 described that she regularly restricts BC1's usage of her smartphone by hiding the phone from her "when she decides it's enough"; otherwise, BC1 will stay on her phone for hours.

Group C. Group C consists of seven participants: a single mother (CP1) and her three children, of which two participated in the study, a 10-year-old boy with ADHD and Autism Spectrum Disorder (ASD) (CC1), and a 9-year-old girl with ADHD and ASD (CC2), and the children's therapists, including a psychologist for both children (CT1), a speech therapist for CC1 (CT4), an occupational therapist for CC2 (CT2), and a speech therapist for CC2 (CT3). The family belongs to a socio-economically disadvantaged societal group facing daily challenges. Therapists highlight the family's social, emotional, and cognitive difficulties. CP1 acknowledges a lack of personal time (CP1) and discusses the emotional and practical hurdles she encounters. Both children have difficulties "both in the communication part, in the speech and in the psycho-emotional part" (CT1), and struggle with identifying, recognising and expressing their experiences and emotions. Therapists reported that both children find it easier to express positive than negative feelings. CC1 is currently facing challenges in school. In contrast to her brother, CC2 sometimes shares her experiences with the therapists. Regarding the use of technologies, while there are no explicit screen time rules in place at home, each family member only spends a maximum of half an hour per day on their phones due to their demanding schedule. Regarding the therapists of group C, all therapists reported using their smartphones multiple hours on a daily basis.

Group D. Group D consists of four participants: a single mother (DP1), her 9-year-old son with ASD[3] (DC1), and his two therapists (DT1, DT2). DP1's daughter lives with the father, separately from DP1 and DC1 (this change happened approximately 2 months before starting the study). The participating therapists include an occupational therapist (DT1) and a psychoeducator (DT2). DT2 has a background in educational rehabilitation, but has recently changed jobs and now works as a psychoeducator at the therapy centre together with the rest of the therapists in this study. When asked to describe her current occupation, she identified as a therapist. DP1 reported spending most of her time outside of work with her son DC1 and having a challenging and stressful schedule. DC1 tends to limit the expression of emotions, particularly negative ones, and at times, exhibits outbursts and aggressive behaviours, particularly towards DP1. The therapists reported that "it is difficult for him to communicate his feelings, but also to record his feelings" (DT1) and that he may have intense (emotional) reactions or provocative behaviour. Both therapists have only recently started working with DC1 less than 2 months prior to starting the study. They reported that while they know that DC1 exhibits such behaviours outside of their sessions, particularly with his mother, he has not exhibited such behaviours with them. There are no specific screen usage rules in the family; it depends on the day's schedule, including homework and activities. Regarding the therapists, DT1 reported using her smartphone very little in general, while DT2 reported that she also does not use her smartphone more than a couple of hours a day.

Group E. Group E consists of four participants: three members of a family and a therapist. The family consists of a mother (EP1), a father, an 8-year-old boy with ADHD (EC1), and an 11-year-old neurotypical girl (EC2). ET1 (the same person as CT4 from Group C) is the speech therapist of EC1. The family and the therapist reported healthy relationships and communication patterns with each other. EP1 describes herself as reflective but does not share her thoughts and emotions with others. EC1 shares his experiences but only if "something is very interesting to him" or "he is impressed by it", while EC2 "will talk a bit easier" according to EP1. EP1 reports that EC1 has a very strong bond and good relationship with ET1 and have been working together for 4 years already. With regards to screen time, there are no specific screen time rules enforced in the family, with participants reporting that the children are free to use their devices (smartphone for EC2, tablet for EC1) unless EP1 says they had enough time and should stop.

5.2 Data Collection

All online study sessions were video-recorded, and all in-person sessions were audio-recorded for later transcription and analysis, with the participants' consent. We adopted a mixed-method approach where we primarily aimed to capture rich experiences of using REMEMO in qualitative accounts. We supported these accounts with additional quantitative data collection. For each participant group, we collected usage logs of the app which tracked their interactions with the app, including each time they launched REMEMO, overall time spent on the app, number and content of posts, who they shared their posts with, how many they deleted, as well as comments to others' posts and revisits to their own. Quantitative data was collected from two validated questionnaires, one for the children and one for the adult participants (see section 5.2.2). We also collected qualitative data through two semi-structured interviews that took place at the introductory and debriefing sessions, and post-study notes per participant.

5.2.1 Interview Protocol. The two semi-structured interviews were tailored to the role of the child, parent, or therapist. The interviews were conducted in the respective native language of

[3]This is the description that was approved by the participating family. DC1 was deemed eligible to participate in the study based on his therapists' assessments of ADHD traits.

the participants. The full interview protocols can be found in the supplementary material. In an initial introductory session, participants shared contextual information about their routines and habits, technology usage, methods to record and express experiences and emotions, and existing communication processes within all parties of the ecosystem. Therapists were additionally asked to elaborate on their outside perspective on the family's communication strategies and approach to emotional expression, on tools they use in therapy, and on their sessions' structure and goals. An overview of these findings is presented in subsubsection 5.1.1. The introductory interviews lasted between 5 and 23 minutes ($M = 10.6$, $SD = 6.6$) for children, between 7 and 44 minutes for parents ($M = 22.2$, $SD = 19.5$), and between 11 and 16 minutes for therapists ($M = 12.7$, $SD = 2.5$).

In the debriefing interview, participants reflected on their routines and any unusual events that transpired between the introductory and debriefing interview, both for themselves and for the child(ren) in their group. They also reported on how they used REMEMO, discussed reasons for limited usage if applicable, gave general feedback and explored the effects they experienced due to using the app. The debriefing interviews lasted between 5 and 25 minutes for children ($M = 15.7$, $SD = 8.3$), between 15 and 64 minutes for parents ($M = 38.6$, $SD = 23.5$), and between 26 and 44 minutes for therapists ($M = 37.8$, $SD = 6.4$).

5.2.2 Measures. Children and adults received different questionnaires. The adult participants were asked to fill out the User Experience Questionnaire [40] (UEQ) in the second session, to measure the user experience of REMEMO. Participants rated 26 pairs of graded antonyms and attributes of the system related to its pragmatic quality (i.e. usability and utility) and hedonic qualities of the application (i.e. the joy of using as well as the stimulation the system may evoke). The 26 items are categorised into six subscales: Attractiveness, Perspicuity, Efficiency, Dependability, Stimulation and Novelty. The UEQ is already validated in Greek and German. Higher values indicate a higher user experience of REMEMO.

The children participants were asked to fill out specific items of the Middle Years Development Instrument (MDI) [66], a self-report questionnaire that asks children about their thoughts, feelings and experiences. The MDI uses a strengths-based approach to assess five areas of development that are strongly linked to well-being, health and academic achievement: social & emotional development, physical health & well-being, connectedness, use of after-school time, and school experiences. In our study, we asked children to fill out the questions of the following MDI measures: Optimism, Empathy, Self-esteem, Happiness, Absence of sadness, Absence of worries, Self-regulation short-term, Self-regulation long-term, Responsible decision-making, Self-awareness, and General health. By combining MDI measures relating to children's physical health and social and emotional development that are of critical importance during the middle years, the Well-Being Index can be calculated. The Well-Being Index encompasses three categories of well-being, thereby providing a holistic summary of children's mental and physical health: 'Thriving,' 'Medium to High' well-being, or 'Low' well-being. The MDI has an officially validated German version [51]. For translation to Greek, the measures of the MDI we employed in our study were translated by two independent translators fluent in both English and Greek and back-translated by a third person bilingual in Greek and English.

5.2.3 Post-session Notes. The experimenters present in each study session also collected detailed post-study notes. These included their own impressions as well as comments and remarks about the participants' interaction with the app collected throughout both interviews and when participants reached out to the experimenters with questions during the runtime of the study.

5.3 Procedure

The longitudinal field study was adapted to the participants' availability and preferences. For all groups, experimenters gathered contextual information in an introductory session, then participants used the app for four to six weeks, and finally, participants shared their experience with the app in a debriefing session. Depending on participants' preferences, the sessions were conducted either online or in person. During the field study, participants could always reach out to the experimenters via texts, phone, or video calls in case of questions and for technical support.

5.3.1 Introductory Session. The introductory session revolved around presenting REMEMO and gathering contextual information about the participant groups (presented in subsubsection 5.1.1). The session started with welcoming the participants and explaining the procedure. After giving consent, they filled out the questionnaires, if applicable, and conducted the introductory interview with the experimenter in a one-to-one setting. If requested by the children, the experimenter helped with answering the questionnaire. Afterwards, the experimenter installed REMEMO on the participants' devices, using TestFlight for iOS and APK files for Android. The experimenter then walked the participants through every feature of REMEMO. The participants created a test post themselves as practice and were provided with a tutorial, which could be revisited at a later stage. The tutorial is available in the supplementary material.

5.3.2 Debriefing Session. The debriefing session revolved around understanding the experiences of participants during the weeks of using REMEMO. Participants filled out the questionnaires and conducted a debriefing interview with the experimenter. Similar to the introductory session, some children (of groups C and D) requested help with filling out the questionnaires. Finally, participants were asked if they wanted to continue using REMEMO, stressing that it was a prototype that was not released for public use.

5.4 Data Analysis

All 36 study sessions (18 participants, two sessions per participant) were transcribed verbatim. Eight of the sessions were conducted in German and the remaining 28 were in Greek. They were all translated into English. Two authors analysed six transcripts by iteratively performing open coding [12], using the MaxQDA software. After an initial round of open coding, a coding tree was discussed and agreed on. Then, the remaining material was coded by three authors. Following that, the authors conducted thematic analysis in line with Blandford et al. [12]. Any disagreements that arose were resolved by discussion.

6 Findings

Here, we present our findings based on the analysis of the field study. In particular, we present quantitative results from the questionnaires administered pre and post and from the usage logs, as well as qualitative insights from the interviews.

6.1 Quantitative Results

Table 2 shows how participants used REMEMO throughout the study duration, exhibiting a variety of behaviours in terms of frequency and using REMEMO's features. This enables us to study the experience of REMEMO in detail. This variety regards both participants within the same group, e.g. AC1 shared all the posts she created, while AP1 kept several posts to herself, as well as across the groups, e.g. while BC1 created seven posts, CC1 created only one.

We analysed UEQ results by calculating summary scores along UEQ subscales and comparing them with benchmarks provided with the scale. Table 3 shows the results for UEQ's subscale.

Table 3. UEQ ratings for REMEMO submitted by adults along the UEQ subscales. The range of the scales is between -3 (horribly bad) and +3 (extremely good). According to the UEQ benchmark, REMEMO was ranked *excellent* in all subscales.

Attractiveness		**Perspicuity**		**Efficiency**		**Dependability**		**Stimulation**		**Novelty**	
M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
2.48	0.43	2.48	0.68	2.11	0.77	1.91	0.64	2.02	0.75	2.02	1.01

Table 4. Detailed MDI results for Child participants aged over 10, before and after using REMEMO. Cases where answers changed after using REMEMO are highlighted in green for an increase and in red for a decrease. H—high, M—medium, L—low.

ID	**Time**	**Optimism**	**Empathy**	**Self-esteem**	**Happiness**	**Absence of sadness**	**Absence of worries**	**Self-regulation (short-term)**	**Self-regulation (long-term)**	**Responsible decision-making**	**Self-awareness**	**General health**	**MDI Well-being Index**
AC1	Before	H	M	H	H	H	H	H	H	H	M	H	H
AC1	After	H	M	H	H	H	H	H	H	H	M	H	H
BC1	Before	M	H	H	M	M	L	M	M	H	H	M	L
BC1	After	M	H	H	M	M	L	M	M	H	M	M	L
CC1	Before	H	M	H	H	H	M	M	M	M	L	H	L
CC1	After	H	M	H	H	L	M	H	H	M	M	H	L
EC2	Before	H	H	H	H	H	M	H	M	H	H	H	H
EC2	After	H	H	H	H	H	M	H	M	H	H	H	H

According to the scale documentation[4], REMEMO was ranked *excellent* along all the UEQ subscales. Child participants aged over 10 completed the MDI questionnaires before and after using REMEMO. Due to the sparsity of the data and to maintain full transparency, we decided not to conduct null hypothesis testing on the data set. Instead, we present the full answer set in Table 4.

6.2 Qualitative Findings

We analysed both the users' interactions with the app, such as the content of their posts, their sharing habits, revisits, and comments, as well as the interview transcripts and post-session notes. A key aspect that surfaced was that specific user groups used REMEMO with different goals in mind, resulting in different interaction patterns. Children mainly placed the focus on themselves, i.e. their own experiences and emotions. Parents switched between using it for themselves and others, e.g. as a journal or to enhance understanding of themselves or the child, while therapists

[4]https://www.ueq-online.org/

primarily focused on others, i.e. the children. When participants' main focus was self-driven, they used the app for i) self-expression, resulting in the app being an emotional outlet for them, ii) getting feedback or anticipating other users' reactions to the posts they shared, or iii) self-recording, which in some cases led to self-reflection. For instance, AP1 reported using REMEMO frequently as a form of a digital diary, both to *"get [things] off [her] chest"*, and to revisit previous posts and write down new realisations after some time had passed. When participants focused more on others, they mainly wanted to share information with care ecosystem members and foster empathy and better understanding of others. As an example, therapists recorded specific games for training emotional expression they used in a session and shared that with other therapists, who found this information very insightful. As an example to foster empathy, AP1 often used the app to make AC1 realise how her actions affect others, *"because for me (AP1) it's more about one person being able to tell the other what it does to me when it goes like this.* AC1 stated that the app led her to *"sometimes"* realise *"things that [she] wouldn't have thought that at all or that was somehow new."*

Based on our qualitative inquiry, five themes were conceptualised from the data, which we detail below: *Emotional Expression & Reflection*, *Communication & Relationship Building*, *Therapeutic Practices & Interactions*, *The Role of Mutual Understanding and Trust*, and *The Role of Background & Contextual Challenges*.

6.2.1 Emotional Expression & Reflection. Our analysis showed that REMEMO allowed both children and parents to engage in emotional expression and reflection, and supported becoming aware of emotions and empathy, both when using it with a focus on the self and others. Additionally, it encouraged reflection for some therapists.

Identifying, Expressing, & Sharing Emotions. By allowing users to log their experiences and emotions, REMEMO supported participants in identifying, expressing, and sharing their emotions. For example, AC1 commented that *"I'm just that kind of person, I don't talk about feelings. And then, if I do that with myself, so to speak, then it's just easier."* As a second example, AP1 noted how she frequently used the app as a digital diary, writing *"things of my own in there, I've just used it for myself, things that I said I didn't understand, that I kept to myself, that I didn't share with anyone, but just for fun"*. While she usually finds that *"boring"*, *"the app gives me a bit more motivation"*. Additionally, children enjoyed recording their experiences and emotions, with BC1 liking *"both, I thought the fun factor was cool, but also thinking about feelings."* BP1 described seeing REMEMO as a *"positive tool"* that could help her child *"to describe feelings"* and *"helps her to cope better in everyday life, that helps her on her way to becoming an adult"*. Moreover, the app facilitated emotional sharing. For instance, DC1 commented that he liked being able to *"save his feelings"* in the app *"because I can show (to others), let's say, if I think something is wow for me or if...if something makes me happy or if something makes me scared or something like that."* Notably, REMEMO specifically prompted users to log only positive experiences, based on prior work that guided our design decisions [79]. Some participants bypassed this and proceeded to log negative experiences as well, such as a fight, an experience making them angry, or an illness. Both AP1 and AC1 requested that future versions of the app should include the ability to select whether the experience they are logging is positive or negative, or to at least provide a neutral template, while others enjoyed the positive focus (e.g. BC1). It also allowed caregivers to acquire insights into the children's emotions; for instance, BP1 noted: *"That was touching to see how she (BC1) feels about it. Because you can't always get there in everyday life, or I have to have a lot of patience to be able to access an emotion (...) And that's where it helps me, or I hope that we can simply continue to do this and that I have an additional channel."*

Regulating Emotions. Besides learning to identify and express emotions, we found that REMEMO also helped participants regulate them. Our analysis showed that the app can serve as an *"emotional*

outlet" (BP1), with BP1 elaborating on its benefits in that regard: *"What I've seen over the years is that these special children push the parents to their limits (...) For the children it's such a great ordeal, constantly being told what they can't do, what they haven't done right, they're always being told off (...) if there is an outlet [through REMEMO] for these families, then I think that's good."* Additionally, participants found that REMEMO afforded them the necessary time and distance to process feedback and criticism. To illustrate, AP1 and AC1 had a recurring fight – dating back to before the study – about AC1 opening her mother's packages. AP1 narrated that this typically ends in a fight with both their emotions running high, with AC1 *"exploding"* and shouting when being criticised about this habit. With REMEMO, AP1 created posts on two occasions where AC1 again opened her packages, explaining how that made her feel, to which AC1 reacted with emojis. When the topic of opening packages was brought up again afterwards, she felt able to have a calm discussion about it with AC1. She elaborated: *"When I try to tell her something, she often isn't willing to listen. She doesn't have the peace and quiet for that. There is this [basic attitude], 'ah now stop it, I don't feel like talking about it'. And that's why I find it easier with the app. That doesn't mean that for me the app should replace personal conversations. But especially when it comes to this package story, I said that if the app hadn't happened in advance, she would have reacted completely differently. (...) She didn't get out of control, not at all. It basically helped [AC1], if you like, to stay at a lower level. She didn't immediately freak out because she heard criticism from her mother again."* Moreover, our findings showed that REMEMO can up-regulate emotions, in other words, foster positive emotions. The most prominent example of this is when participants revisited posts. EP1 explained: *"it made my mood better, for example, the post regarding our trip, was something pleasant, the experience we had [there] was nice, so yes, it made me happy to see it again"*.

Reflecting on Emotions & Behaviours. Additionally, REMEMO encouraged reflection in different ways and through the use of different app features. First, the app supported self-reflection by encouraging participants to think about their experiences and emotions and record them in REMEMO. According to some participants, even the act of giving the post a title supported reflection: *"Well, you start at the beginning by making the title first, so to speak. And I found that interesting because you have to think about what you're going to call the whole thing at the beginning and then develop it afterwards (AP1)"*. Furthermore, when creating a post, some participants reported feeling like writing a post was a cathartic activity, which helped to externalise and solve problems. For instance, AP1 wrote in REMEMO about a problem, then thought about a solution, revisited the post to note down the solution, and, when getting upset again about the problem later, remembered the solution she had previously logged. The participants also reported their perspectives being changed, with AP1 mentioning two posts that she kept only for herself and how *"I know for sure that one of them has changed my perspective"*. Moreover, revisiting previous posts was helpful for reflection for some users, as *"you can also recapitulate for yourself afterwards, what feelings did I have there and how do I feel about it now? (AP1)"*. BC1 commented that *"sometimes it was like, huh, I couldn't understand that at all, (...) why did I upload that now? (...) I've looked at them sometimes, then thought about it. In retrospect, I thought, ah, that was interesting that I felt like that back then."* Apart from REMEMO supporting self-reflection, it was also used as a way for parents to encourage their children to reflect. In this case, the app served as feedback from the parent to the child to get the child to (re)think about things, reflect, and realise the effect of its actions. Moreover, participants reported that REMEMO encouraged joint reflection and empathy between parent and child (e.g. between AP1 and AC1), as it nudged them to see the other's perspective and helped them realise when their actions were affecting the other person. In particular, AP1 often made posts about AC1's behaviour and shared those with her because *"it would give her another opportunity to think about it. She can look at it at any time and can also think about it again herself."* Interestingly, our analysis showed that

the app could support reflection even when users did not actively make posts. Some participants elaborated on how they thought extensively about creating a post but without actually posting something due to contextual challenges such as becoming interrupted (see subsubsection 6.2.5 for more information), while others thought back to what they had posted before.

6.2.2 Communication & Relationship Building. Our analysis also highlights how REMEMO can support communication and relationship-building between children and their care ecosystem. This was most prevalent for parent-child and therapist-child interactions. This theme explores the app's collaborative aspects, focusing on features like sharing, commenting, and jointly creating posts.

Strengthening Relationships. Further, we found that REMEMO can strengthen relationships, by supporting affectionate and fun communication, particularly in child-child, child-therapist, and parent-child interactions. This mainly occurred by sharing (funny) pictures and notes, caring and affirmative messages, and highlighting joint memories. To illustrate, AC1 and BC1 shared several funny pictures and texts with each other, which BC1 acknowledged was sometimes *"nonsense"*, but that *"it was funny to see what the other person had written in there. So, I have a few funny photos of [AC1]. I put them in, and they were only sent to [AC1]. So nobody else could see them. That was rather funny"*. As an example of affectionate communication between child-therapist pairings, EC1 shared a post to CT4/ET1 to wish her a happy birthday, as they did not see each other that day. CT4/ET1 liked the attentiveness, stating that *"I liked [this] incredibly, I was incredibly happy"*. Moreover, we found that some therapists used REMEMO during their session with the children *together*, as a collaborative activity meant to strengthen their relationship. For instance, DT2 reported using REMEMO as a mutual, fun activity to build their relationship, especially since they had only recently started working together, highlighting how it helped her *"to spend some nicer moments with [DC1]"*. Finally, both parents and children posted about mutual activities and nice memories together and shared them with each other. For instance, AC1 shared a post with her mother about spending time and taking photos together, uploading some of these photos and using several heart emojis, who also reacted to it with emojis. Parents also posted about their appreciation and pride about something their child had done to share how happy this made them feel. As an example, AC1 had drawn a big heart in the snow covering the front lawn while on the way to school. AP1 thought that *"it was really cute, I was really happy about it"*, thus taking several photos of it. She shared them in a post with AC1, including how seeing it continuously made her happy. CT3 was wondering whether therapists should be able to directly share posts with children, as she imagined that this could have positive effects on her relationship with CC2. She noted that *"I believe that the way [CC2] could have used it is to strengthen our relationship with what she sees, that we did this together with my therapist, my therapist shared it, my therapist was happy that we did it together. To see the happiness, because it exists in a visual way, and to say this is how we are similar, and that would help our relationship."* However, she was apprehensive of the safety risks embedded in that and agreed that specific regulations should be in place for such interactions, e.g. that the posts should automatically be shared with the parents as well, as bypassing the parent in this context would be *"very problematic"* (CT3, CT1).

Transparent Communication. Our analysis demonstrated how the app supports transparent communication across the ecosystem's stakeholders, especially in the context of therapist-parent and therapist-therapist interaction. First, it allowed therapists to share moments with parents from their sessions with the children, which the parents highly appreciated. For instance, CP1 noted how *"she liked seeing the post that [CT1] shared with her"*, while DP1 noted: *"Usually, when [DC1] goes to the sessions, I have no idea what's going on. I liked it when I saw that they were playing, they were having a good time, and through the game, there was this interaction (...) And I liked to see how [DC1]*

behaves when he is with one of the [therapists]. Because I was indeed wondering about that" Regarding therapist-therapist communication, REMEMO supported transparent and direct communication, allowing them to acquire insights about and gain inspiration from each other's therapeutic work. CT1 was very excited about this opportunity: *"I knew approximately what they would work on, but not in the way that they did it with this game, that they used it for this activity. (...) I was excited when I saw, for example, from [CT3], exactly how she did it [the activity in the post], I liked it a lot. (...) Because it helped me see how they were doing what they wanted to do, since I wasn't involved in that session. And as an idea, with this gaming style, how she managed to insert something that she wanted to work on. Because [I saw that CC2] likes that."*.

6.2.3 Therapeutic Practices & Interactions. REMEMO was found to support therapists as a tool that is portable and instantly accessible in preparing for and documenting their sessions. The app serves both as a means for inspiration and a reminder for goal setting. For example, CT4 noted: *"I go back to see what goals I had set the last time, so I can continue with the goal from where I left it off"*, and particularly CT1 got new ideas on how to include certain methods used by other therapists into their own session, thereby also fostering the communication between therapists (see section 6.2.2). Furthermore, they utilised REMEMO as a recording and documentation tool, either replacing or augmenting the regular session documentation. CT4 imagined how REMEMO could replace her other documentation strategies, leveraging that it allows for different forms of documentation through the use of media, as well as instant sharing of this documentation with others. To further facilitate the usage of REMEMO as an assistive tool for therapists, therapists suggested receiving notifications if a post is shared with them (CT1, CT2, CT4). However, they noted that they *"would like to have the option to decide whether to receive the notification or not (CT4)"*. Additionally, CT4 reflected that using REMEMO would increase her work-life balance, as work-related messages would not be sent via private messaging apps as is the case now: *"so that Viber (a private messaging app) does not ring, let's say, for work issues (CT4)"*. Second, therapists used REMEMO as a therapeutic tool during their sessions. They used it together with the children, either to help them practice emotional expression and reflection, or to engage in a mutual activity, thereby strengthening their therapist-child relationship (see subsubsection 6.2.2). In that regard, therapists, together with the children, created posts either on their own or on the children's apps. They envisioned that they could also make posts individually on their respective devices, but at the same time. For example, the therapist asked the child to complete the question "What were the emotions of the child?" on their app themselves (CT3 and CC2). Notably, therapists highlighted how they only let the child get glimpses of their app in those specific moments, keeping their other uses for themselves. Although some therapists envisioned only using the app in this collaborative manner, they also discussed challenges in that regard. For instance, in the example above, CC2 required constant supervision so as not to get distracted, making CT3 struggle with creating the post on REMEMO at the same time. To mitigate this, CT3 proposed a saving function for posts so that they could be completed later.

6.2.4 The Role of Mutual Understanding & Trust. We also found that the way participants used the app heavily depended on the interpersonal dynamics between them, and in particular on mutual understanding and trust. We identified that different expectations or lack of mutual understanding of how to use the app between children and parents could lead to challenges. For example, a few days after starting the study, BP1 made a post about BC1's grade in a maths test, reflecting on how, even though the grade was bad, BC1 was not as sad as BP1 expected. Instead, she noted that it will get better with the grades in the future, especially after BC1 starts taking medication to support her in various daily challenges. BP1 included *"I admire her for her confidence and optimism"*. BP1 shared that post not only with BC1, but also with AP1, who then proceeded to mention the post and BC1's grade to AC1 (in person). When meeting with BC1 in person, AC1 mentioned that to

BC1, which led to a fight between BP1 and BC1, and BC1 feeling *"betrayed" (BP1)*. BP1 explained in her debriefing interview how *"BC1 was angry with me"* and *"there were tears, the doors banged"*. This occurred even though BP1 insisted that BC1 should read over the post, and how *"it was well-meant (BP1)"*, BC1 *"couldn't read and understand that (BP1)"*. BP1 then explained how this now would make her *"think very carefully about what I share and what I don't"*. BC1 also mentioned how her *"mum didn't post anything mean about me either, but she did post my maths grade at one point, and I didn't think that was cool" (BC1)*. She then elaborated that, as a consequence, she *"made sure that [she] didn't make anyone look stupid or deliberately make someone look bad or anything (BC1)"*. Therefore, different interpretations of what is acceptable to post and share with REMEMO led to BC1's trust being broken, as her own expectations clashed with those of her mother, and this led to changed app usage for both of them. This also links to BC1's privacy concerns, which she elaborated on in both her interviews. Especially in the second, BC1 further emphasised how she would not like to share her posts with people outside her care ecosystem and that she now pays close attention to whom she shares her posts.

Another pertinent example showing how different usage expectations surfaced is when children were using REMEMO to have fun, but parents still tried to enforce their own views about how the app should be used. In particular, AP1 criticised how AC1 used the app to share funny pictures and moments of her life. For example, AC1 made some posts with pictures of her classmates, noting to each one *"This is [name of classmate"]*, to which AP1 commented: *"But there have also been other things where I've said to her, [name of child], stop just posting rubbish. Focus a bit like that. Do it when you really have something to say, and you can show me the picture of your classmate like that (referring to the photo gallery on the phone). I know that you're not actually allowed to use these things at the moment, but before you turn it into a post where I don't know how to react to it, should I say that she looks nice or what should I say? At some point, I said, well, now it's time to stop it."* The above examples underline how the complexities that exist in (ADHD) families and their communication in real life can potentially transfer to the technologies that they use.

The aforementioned example of participants being mindful of privacy and what is shared via the app relates to some concerns that the therapists had about sharing posts in REMEMO. In particular, one therapist participant created some posts but then debated whether to share them with the parent, as she was afraid of potential misunderstandings. She commented on existing communication barriers between the two of them and noted how she was not confident that the parent would understand what she shared with them, thus potentially leading to misunderstandings that she wanted to avoid. This further underlines the complexities of communication and using technologies within the care ecosystems of ADHD children.

6.2.5 The Role of Background & Contextual Challenges. We found that some participants only engaged with REMEMO in a limited manner, which was attributed to the limited time available in their daily lives. Some parents reported getting interrupted in the post-creation process or even forgetting to post (e.g. BP1 due to a severe illness). One example is the family of group C, who faced significant physical and emotional health challenges during the study period. This is also corroborated by the results of the MDI questionnaire, where CC1 scored "low well-being" both pre and post. Additionally, the tablet on which CC1 was using the app broke in the middle of the study, and the family did not have the chance to replace it. Interestingly, the mother insisted that she wanted to continue having the app on her phone when asked about it during the debriefing interview, expressing how she thinks that *"if we are calm, like now that the schools will be closed [for Christmas] and we don't have activities"* they might be able to have the time to use it. When asked why she wanted to keep using REMEMO, she stated: *"Because it's a way, through this application, to know what the child likes (CP1)"*.

Further, some participants explained that they needed more time to familiarise themselves with the app and to integrate it into their routine. While true for both parents and therapists, the latter extensively focused on this aspect, which is understandable because therapists were asked to use the app in a more formal and clinical setting, unlike the comparably fun and relaxed setting that parents and children had, leading to overall different constraints on adoption. For example, one therapist restrained from saving an unpolished post due to being concerned about the perceived permanence of recording something in the app versus on paper (CT3). Some therapists also pointed out that the weeks of the study were particularly pressured and stressful, for some even more so than usual, due to both personal and work-related factors. For instance, CT1 elaborated: *"I thought about it a lot, every time, that I should upload something....I wanted to, but every time, because the truth is that I went to one session, after another, after another, it was as if I was forgetting it, as if it was leaving my mind, this thing. That was the only reason."* Moreover, some therapists noted that the lack of interaction with REMEMO of other members of their participant group decreased their own motivation to use it. They specified that they were looking forward to interacting especially with the children, but those specific children did not use the app that often. This was especially the case for therapists who envisioned using the app in more collaborative settings, i.e. together with the children. For instance, CT2 noted how *"I wouldn't use it to record my documentation of my sessions. Maybe because I'm not used to it. I thought about it more as an activity together with the child."* However, this did not seem to be a constraint for therapists who primarily wished to use REMEMO for documentation and as a tool to support their therapeutic work (e.g. CT4).

Additionally, a few participants (DP1, DC1, EC1, EC2) faced technical difficulties, in particular with a single feature: uploading images. This resulted in failing to upload their posts and giving up after a few failed tries. In some cases (e.g. EC1 and EC2), the first author had a call with the participants to resolve the issue and suggested that they use any of the other available media in the meantime. This led to positive reactions from EC1 but not from EC2, who kept insisting on using pictures. Thus, this was another challenge that led to decreased use of the app by some participants.

On another note, the therapists in all the groups highlighted how the app could be very helpful, but that there are specific criteria that a child has to fulfil *"functionally"* to use it in a meaningful way, which do not depend on the child's diagnosis, but on the child's *"clinical picture"*. DT1 elaborated further on this: *"This has to do with (...) what abilities are needed to use this app? (...) The executive functions need to be at a specific point (...) they need to have a good cognitive level to understand the app's functionalities. It doesn't mean that all the children in the spectrum will have these abilities or they won't have them, and the same for ADHD, some children may be able to do it and some may not."* Therefore, therapists proposed that, while asking specific questions that children have to fill out to complete a post is good *"from a psychoeducational point of view (DT2)"*, some children *"may find it difficult (DT2)"*. This was corroborated by DP1 and DC1, who noted that they should have the ability to skip at least some questions. DP1 suggested that this was one of the reasons for DC1's limited use, that *"he doesn't have the patience for it (DP1)"*. Apart from the therapists, the majority of parent and child participants stated that they would like to be able to always answer the first introductory question and add the emojis, while skipping some of the other questions, depending on the post they were creating.

7 Discussion

This research showed that a multi-stakeholder app that was designed by actively involving ADHD children and their care system has the potential to support their needs and interests **(RQ1)**. Specifically, we designed, evaluated, and deployed REMEMO, a mobile app that enables the logging and selective sharing of experiences and emotions and offers different features, adapting to the user type (child, parent, or therapist and educator). By deploying REMEMO in the field for 4–6 weeks

with five different groups consisting of children with ADHD and their parents, and additionally siblings and/or therapists for some groups, we demonstrated how embedding such a technology in their lives can impact their communication, everyday interactions, and well-being **(RQ2)**. Quantitative results demonstrated the variety in how participants used REMEMO throughout the study (Table 2) and that usability was not a concern, as the app received excellent rates across different UX scales (Table 3). While quantitative data does not allow us to draw conclusions on how REMEMO affected the well-being of children in the study, our qualitative analysis showed that it can foster emotional expression and sharing, and can support therapeutic practices, reflection, communication, and relationship building, among others. In that respect, research has shown that both reflection [14, 32, 41, 58] and emotional expression [50] can foster well-being, and Keyes et al's. [36, 37] definition of well-being includes the aspect of healthy relationships. Despite these positive aspects, several challenges were identified, including power imbalances between children and parents and the amplification of existing interaction challenges within the care ecosystem, which may hinder adoption. Below, we reflect on our findings and our experiences in conducting this research and present key takeaway messages and recommendations for future work (marked in **bold**).

7.1 Designing Technologies that Cater to the Varying Needs of Different Stakeholders

Throughout this research, we sought to actively include both ADHD children and their care ecosystem, designing a multi-stakeholder technology, i.e. usable by different ecosystem stakeholders, that would cater to their sometimes very different needs and interests. Our field study demonstrated the benefits of such a technology, which we reflect upon below.

7.1.1 Balancing Fun & Serious Use. Our findings show how technologies like REMEMO could allow for fun interactions (see section 6.2.2), as well as support children with specific ADHD-related struggles, such as emotion regulation (see section 6.2.1). These findings reflect the suggestion made by previous work to both focus on ludic aspects [78] and empower children with ADHD by allowing them to make choices in their use of technologies, e.g. *how* they use it [78], as well as support ADHD children's caregivers with symptom management, aligning with their expectations of technology use [79]. Whilst our results showed that it requires a reasonably established foundation (in terms of contextual factors as well as a solid social system) for the successful integration of the system in the care ecosystems, our results also showed that when users actively integrated the app into their daily lives, multiple aspects could be addressed, as in such cases, REMEMO can allow for both fun and serious use. Unlike previous work that often combined such aspects, for example by embedding ludic elements into family routines, such as shared mealtimes [1], or creating serious games [3, 72], REMEMO provides opportunities for individualised ways of use, empowering ADHD children (and their care ecosystem) to autonomously choose their specific ways in which they wish to engage with the technology. **Therefore, future designs should provide distinct pathways for both fun and serious interactions, allowing users to choose their engagement methods autonomously.**

7.1.2 Empowerment through Manual Tracking & Active Stakeholder Involvement. Our findings indicate that allowing children to manually log their experiences and emotions without external support or influencing factors, such as wearables or corrections from adults, enables them to engage with REMEMO in a carefree way, potentially increasing their motivation. Choe et al. [17] proposed that users' motivation needs to be considered when designing for different levels of tracking (manual, automatic, or semi-automatic). In our study, we found that **manual tracking, done independently by children on their own terms, plays a crucial role in supporting their agency and empowerment**.

However, this approach presents a significant design challenge in balancing children's playful and expressive needs with the structured requirements of adults like therapists and caregivers. While children's logged emotions using emojis were not always perceived by therapists as accurate reflections of their emotional states, granting them autonomy without adult correction seems to yield positive outcomes. Therefore, adults need to consider this aspect of self-expression and autonomy when evaluating the child's data, as it respects the child's perspective and fosters an empowering environment for their communication. Conversely, adult interference risks turning the app into a chore imposed by the adults [79]. Hence, **finding effective ways to support children in communicating their emotions and experiences to adults represents not only a challenge for parents and therapists but also poses a unique interaction design challenge for future work**.

Furthermore, being able to share posts was found to facilitate transparent communication within the care ecosystem. This has the potential to mitigate negative outcomes associated with communication barriers in care teams of children, such as information loss and unclear goals stemming from different approaches and motivations [60] and to alleviate misunderstandings and reduce uncertainty [88]. Previous work has established a link between providing caregivers with the ability to share tracked caregiving data with other family caregivers and increased emotional well-being [88]. Our work extends this understanding by demonstrating that **well-being and relationships can be further supported by involving children as active participants in tracking and sharing information on caregiving, experiences, and emotions**. By designing a system that allowed both common functionalities across users and stakeholder-specific ones, while enabling interaction among different stakeholders, we provided a prototype with the potential to support varying needs within the care ecosystem. Given the diverse caregiving and parenting strategies and contexts, tailoring technologies to users' needs allows for a more nuanced adaptation. Future work could investigate this further, by exploring how the design could support caregivers in integrating their own strategies into the functionalities. This could potentially mitigate the burden of technology usage by allowing users to decide how or when the technology is used. This aligns with previous work that underlined the importance of opportunities for both joint and independent use to avoid restricting autonomy and preventing frustrations [70].

7.2 Integrating & Evaluating Technologies with Vulnerable Populations

While we identified a variety of positive aspects in our field study, our work also shed light on a number of challenges associated with integrating and evaluating technologies with vulnerable populations, such as ADHD children and their care ecosystem. This section engages with these and discusses ways forward and open issues.

7.2.1 Contextual & Environmental Preconditions. The different ways in which children, parents, and therapists engaged with REMEMO over the course of the field study showed insightful dynamics. In particular, our findings highlighted that certain preconditions must be met for the various benefits discussed earlier to be achieved. The first precondition regards the abilities of children to engage with such a system. Our field study revealed that the app requires a specific set of abilities, independent of age and diagnosis, as evidenced by the therapists' reports, including cognitive skills and executive functioning. At the same time, the environment plays a crucial role; encouragement to use the app led to increased usage frequency. For instance, children whose parents used the app frequently tended to use it more often, as overall, the frequency in which parents engaged with the app mostly echoed that of children (see Table 2). Moreover, therapists' motivation to engage with the app was connected to the use by other therapists or group members. Thus, we observed not only the importance of inner motivation and individual engagement with the app but also a

significant interplay between the usage patterns of various stakeholders. This connection among different stakeholders – family, therapists, and children – highlights a complex dynamic in the adoption and utilisation of such technologies. **A critical consideration that emerged is the need to prevent adults' perspectives on the app's ideal usage (frequency) from overshadowing the children's autonomy**. This balance is delicate and essential, especially in technologies like REMEMO, which seek to transcend merely addressing symptoms in neurodivergent children following calls from previous work [75, 76, 78]. Therefore, **future research should delve deeper into how collaborative technologies designed to support both the care ecosystem and care recipients can foster varied goals and behaviours, while crucially maintaining the autonomy of child users.**

7.2.2 Ethical Considerations. In light of our findings, several critical ethical and practical considerations arise that necessitate further reflection. Below, we engage with these topics.

Participant Suitability versus Participant Agency. The first is the ethical dilemma surrounding participant suitability. While many participants integrated REMEMO into their lives and used it to varying degrees, there were others, such as the family in group C, who struggled to do so. Coupled with the daily difficulties faced by group C in particular, this also presented challenges for the researchers when making decisions regarding this group's participation in the study. The mother's (CP1) insistence that they wish to participate, as well as her excitement about the app despite its very limited usage and her wish to keep having it on their devices after the second session, sheds additional light on the vulnerabilities and complicated paths that need to be navigated in such cases. Moreover, therapist assessments suggested that not all participants were ideally suited for (continued) involvement – partly in terms of the life challenges they were currently facing and partly in terms of their abilities (e.g. executive functioning). This is directly linked to some therapists in our study expressing how the specific choice of children to participate alongside them was a demotivator for them to engage with the app. Thus, while the benefits of striving to include "everyone" (of ADHD children's ecosystems) in designing and evaluating technologies are important, it can link to challenges for the included participants [27], as well as responsibilities and hard decisions for the researchers. In particular, this situation presents a significant challenge for us as researchers: Should we prioritise the expressed wishes of participants, or should we consider the therapists' expertise in deeming some participants unsuitable? Added to this is the high relevance of the participants' agency in their decisions, i.e. that they should be the ones to decide whether they wish to be involved, which we did not want to take away from them. This decision not only involves respecting the agency of the participants but also ensuring that their participation does not become an additional burden in their lives. The need to balance these factors requires careful ethical consideration. It underscores the importance of sensitive yet inclusive recruiting practices, especially when conducting research with vulnerable populations. **Thus, ongoing dialogue with the research community and various stakeholders is essential to responsibly address recruitment challenges associated with vulnerable participants, such as families of ADHD children.**

Reflecting on our Method. Throughout our work, we have consciously employed specific measures with the goal of ensuring the safety of our participants, which span both the design of the app as well as the study. Here, we discuss these and reflect on our method in general and the research ethics involved in this endeavour, building on the knowledge base for future CSCW and HCI research with vulnerable populations in general. First, a key reason for the iterative and formative design and evaluation of REMEMO was precisely to deliver a technology that corresponds to the varying interests and needs of both ADHD children and their care ecosystems. Despite the observed

challenges in the adoption of the technology by some participants, our findings showed that this methodological decision was fruitful and appropriate to design a technology that *can* empower and support the well-being of this population. Concurrently, reflecting on our experiences in the study, it seems essential to build a trusting relationship with participants in which users can be open about their decision to opt out as well as to feel supported during their participation. In our work, we strove to do exactly that, by remaining in close contact with participants based on their preferences and by accommodating their needs regarding the location of the sessions. Additionally, the study design itself aimed to support participants' agency and minimise potential burdens, as we explicitly communicated to them that the nature and frequency of use of REMEMO was entirely up to them. This seemed to be particularly important and to alleviate the potential stress of participants that they would not be able to "perform well enough" to participate in the study. Adjusting methodological decisions when conducting research with vulnerable populations is in line with previous work in the domain; for instance, using different materials for multi-modal communication and sharing in accessibility research [42] – echoing the multimodality of REMEMO in creating posts. As another example, Kabir et al. [35] highlighted the difficulties of employing conventional HCI methods with individuals with spinal cord injuries, noting the need to prepare for such studies as researchers carefully. Especially their guidelines around the need to expect difficulties with recruitment and the increased researcher burdens reflect our own experiences in this work, despite the different population groups. **Therefore, we contribute to existing knowledge on adjusting methods to support vulnerable populations in HCI research by advocating for building and maintaining close relationships with participants, while also employing a multi-stakeholder approach throughout technology conception, design, and evaluation to address their diverse needs and interests**.

At the same time, we hypothesise that this close relationship could increase the potential for participants to develop a greater desire to support us in our research, even if it may be a burden for them, connecting to social desirability bias in qualitative research [10]. Concerning these challenges, we have no concrete answers but pose a call to the research community to continue to discuss and reflect on these issues. The aforementioned challenges are particularly prevalent in the context of longitudinal / field studies, where the investment and demands from both participants and researchers are often higher. **The insights stemming from our work in that respect is that there might not be a –technological– solution for everyone, i.e. for every care ecosystem with ADHD children; perhaps it is something to aspire for, and for future work to determine whether it can actually be achieved.** This also links to the concept of technology non-use, which HCI and CSCW communities have been investigating [64, 86], arguing that both non-use and use constitute a range of meaningful and productive behaviours [4, 5, 67]. In our work, we mainly encountered non-users similar to Wyatt's "excluded" group and Satchell and Dourish's disenfranchised, who wish to adopt technology but cannot. Previous CSCW work has also engaged with parental use/non-use of technology, demonstrating parents' multiple and often conflicting motivations and needs around this topic, especially with young children [28]. Most relevant to our work, they highlight the need for mutual understanding of technology use between parents and children, which can enhance self-regulation.

7.2.3 Designing Robust & Forgiving Systems. In our study, we observed a potentially low threshold for frustration among participants, particularly in families. This sensitivity to frustration may be attributed to various factors, including external stressors or simply a lack of time due to numerous other responsibilities, which in turn hinders their ability to report back to researchers. This behaviour became evident in instances where participants ceased using the app after encountering initial difficulties, despite having been instructed to contact us for assistance. The compounded

pressures and time constraints often experienced by these families might contribute to a reduced tolerance for imperfection and challenges in technology use. It is important to be aware of these factors when designing for neurodivergent children and their families. This emphasises the **need for developing more robust and forgiving systems, integrating lightweight or ideally even automatic reporting mechanisms of usage challenges and bugs**. For instance, subsequent versions of the REMEMO app should consider features that allow for interruptions in the post-creation phase, enabling participants to resume their work without losing their progress. This improvement is particularly important, as demonstrated by the case of BP1 in our study, where the inability to save and continue posts at a later time was a significant barrier, leading to a limited number of posts. Overall, the challenges related to recruiting and time constraints in vulnerable groups seem to have a profound impact on their user experience with the technological prototypes they are asked to evaluate. Participants may feel guilty for not using the technology as intended, and there is also the issue of effectively communicating bugs and issues back to the researchers. These dual challenges of guilt and communication barriers are important to consider to ensure that participants feel comfortable and supported throughout the process. In our study, we aimed to address this by proactively contacting participants and asking them if they needed support. As we move forward with our research with REMEMO and similar technologies, we hope to use these insights to shape more inclusive, empathetic, and effective research methodologies and technological designs.

7.3 Limitations & Future Work

We recognise certain limitations to our work. Initially, we planned to involve more groups in our field study; however, recruitment proved to be an especially challenging endeavour. Increasing the number of children in the study would have enabled a more robust quantitative analysis. Recruiting vulnerable populations, such as children with ADHD and their families, is notably difficult, as also reported in previous studies [73, 78, 84]. In our case, the longitudinal nature of the study and our aim to include both therapists and educators further complicated recruitment. While we succeeded in recruiting therapists, recruiting educators remains future work. Despite these challenges, we involved an overall considerable number of participants ($n = 18$ in the field study alone) and collected rich data from both the interviews as well as the questionnaires and usage logs. This allowed us to thoroughly explore the impact of REMEMO on the groups' communications, interactions, and well-being. Future work includes continuing the field study with current participants who expressed their wish to continue, as well as expanding our participant list and recruiting additional groups, including educators. We are also addressing usability issues identified and updating REMEMO based on our findings, such as allowing participants to save their progress when creating posts or skip some questions during post-creation.

8 Conclusion

We presented REMEMO, a multi-stakeholder mobile app for children with ADHD and their care ecosystem (family, therapists, educators). REMEMO enables logging experiences and emotions, revisiting them, and selectively sharing them. Its multi-stakeholder nature lies within the ability of different care ecosystem members to use it, with different adaptations of the app available depending on whether the user is a child, parent, or therapist and educator. REMEMO includes individual and collaborative features, allowing for both personal and joint use. By actively involving ADHD children and their caregivers in the app's design, we were able to cater for varying needs and interests. The multi-week field study we conducted with five different groups, including ADHD children and their parents, and additionally siblings and therapists in some cases demonstrated various usage patterns of REMEMO among those stakeholders. In particular, REMEMO impacted them both individually as well as affected their interpersonal interactions. Our findings showed

that REMEMO was able to facilitate emotional expression and reflection and that it can support affectionate and transparent communication and strengthen relationships, while at the same time allowing children to make choices about their use of the app and have fun. We also discovered that some participants had unspoken expectations regarding the app's use. This highlighted the crucial role of mutual understanding and trust, as a breach in these aspects could affect how they used the app. Additionally, background and contextual difficulties were found to directly affect the frequency and patterns of use of the app and the overall experience. Our research demonstrates how it is possible to design a technology for ADHD children and their caregivers that goes beyond a diagnostic or treatment tool to one that can support their communication and emotional expression. Our work highlights both opportunities and challenges regarding designing technologies that cater to the varying needs of different stakeholders and integrating and evaluating technologies with vulnerable populations such as families of ADHD children. We hope that our work will inspire future research in designing technologies that address both the needs and interests of ADHD children and their caregivers.

Acknowledgments

This research was funded by the German Research Foundation (DFG) under Germany's Excellence Strategy (EXC 2077, University of Bremen). We would like to express our gratitude to all our participants for their time and valuable insights. We would also like to thank Luca Seidler and Lisa Hesselbarth (University of Bremen, Germany) for their assistance with the implementation of the app, and Joanna Poupaki and Areti Ximeraki for their help with translating the questionnaires. We wish to thank Prof. Johannes Schöning (University of St. Gallen, Switzerland) for his valuable input and supervision of this project. We would also like to thank the reviewers for their valuable and constructive feedback. The REMEMO user interface, depicted in the Figures of this paper and in the supplementary material, has been designed using images made from Icons8.com and by Freepik from Flaticon.com.

References

[1] Ferran Altarriba Bertran, Alexandra Pometko, Muskan Gupta, Lauren Wilcox, Reeta Banerjee, and Katherine Isbister. 2021. The Playful Potential of Shared Mealtime: A Speculative Catalog of Playful Technologies for Day-to-day Social Eating Experiences. *Proc. ACM Hum.-Comput. Interact.* 5, CHI PLAY, Article 267 (oct 2021), 26 pages. doi:10.1145/3474694

[2] Aloha Hufana Ambe, Alessandro Soro, Daniel Johnson, and Margot Brereton. 2022. From Collaborative Habituation to Everyday Togetherness: A Long-Term Study of Use of the Messaging Kettle. *ACM Transactions on Computer-Human Interaction (TOCHI)* 29, 1 (2022), 1–47.

[3] Karina Arrambide, Lisa Freiman Cormier, Rina R. Wehbe, Lennart E. Nacke, Mareike Gabele, Sebastian Wagner, and Christian Hansen. 2019. The Development of "Orbit": The Collaborative BCI Game for Children with AD(H)D. In *Extended Abstracts of the Annual Symposium on Computer-Human Interaction in Play Companion Extended Abstracts* (Barcelona, Spain) *(CHI PLAY '19 Extended Abstracts)*. Association for Computing Machinery, New York, NY, USA, 341–348. doi:10.1145/3341215.3356301

[4] Eric P.S. Baumer, Phil Adams, Vera D. Khovanskaya, Tony C. Liao, Madeline E. Smith, Victoria Schwanda Sosik, and Kaiton Williams. 2013. Limiting, leaving, and (re)lapsing: an exploration of facebook non-use practices and experiences. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Paris, France) *(CHI '13)*. Association for Computing Machinery, New York, NY, USA, 3257–3266. doi:10.1145/2470654.2466446

[5] Eric P. S. Baumer, Jenna Burrell, Morgan G. Ames, Jed R. Brubaker, and Paul Dourish. 2015. On the Importance and Implications of Studying Technology Non-Use. *Interactions* 22, 2 (feb 2015), 52–56. doi:10.1145/2723667

[6] Ashkan Beheshti, Mira-Lynn Chavanon, and Hanna Christiansen. 2020. Emotion dysregulation in adults with attention deficit hyperactivity disorder: a meta-analysis. *BMC psychiatry* 20, 1 (2020), 1–11.

[7] Frank R. Bentley and Sujoy Kumar Chowdhury. 2010. Serendipitous family stories: using findings from a study on family communication to share family history. In *Proceedings of the 12th ACM International Conference Adjunct Papers on Ubiquitous Computing - Adjunct* (Copenhagen, Denmark) *(UbiComp '10 Adjunct)*. Association for Computing Machinery, New York, NY, USA, 359–360. doi:10.1145/1864431.1864435

[8] Marit Bentvelzen, Jasmin Niess, Mikołaj P. Woźniak, and Paweł W. Woźniak. 2021. The Development and Validation of the Technology-Supported Reflection Inventory. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 366, 8 pages. doi:10.1145/3411764.3445673

[9] Marit Bentvelzen, Paweł W Woźniak, Pia SF Herbes, Evropi Stefanidi, and Jasmin Niess. 2022. Revisiting Reflection in HCI: Four Design Resources for Technologies that Support Reflection. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 6, 1 (2022), 1–27.

[10] Nicole Bergen and Ronald Labonté. 2020. "Everything is perfect, and we have no problems": detecting and limiting social desirability bias in qualitative research. *Qualitative health research* 30, 5 (2020), 783–792.

[11] Jomara Binda, Elitza Georgieva, Yujing Yang, Fanlu Gui, Jordan Beck, and John M. Carroll. 2018. PhamilyHealth: A Photo Sharing System for Intergenerational Family Collaboration on Health. In *Companion of the 2018 ACM Conference on Computer Supported Cooperative Work and Social Computing* (, Jersey City, NJ, USA,) *(CSCW '18 Companion)*. Association for Computing Machinery, New York, NY, USA, 337–340. doi:10.1145/3272973.3274091

[12] Ann Blandford, Dominic Furniss, and Stephann Makri. 2016. Qualitative HCI research: Going behind the scenes. *Synthesis lectures on human-centered informatics* 9, 1 (2016), 1–115.

[13] Sean E Brotherson, Takashi Yamamoto, and Alan C Acock. 2003. Connection and communication in father-child relationships and adolescent child well-being. *Fathering* 1, 3 (2003), 191.

[14] Fred B Bryant, Colette M Smart, and Scott P King. 2005. Using the past to enhance the present: Boosting happiness through positive reminiscence. *Journal of Happiness Studies* 6, 3 (2005), 227–260.

[15] Mark Butzer, Zachary Levonian, Yangyang Luo, Kathleen Watson, Ye Yuan, C. Estelle Smith, and Svetlana Yarosh. 2020. Grandtotem: Supporting International and Intergenerational Relationships. In *Companion Publication of the 2020 Conference on Computer Supported Cooperative Work and Social Computing* (Virtual Event, USA) *(CSCW '20 Companion)*. Association for Computing Machinery, New York, NY, USA, 227–231. doi:10.1145/3406865.3418307

[16] Smadar Celestin-Westreich and Leon-Patrice Celestin. 2013. ADHD Children's Emotion Regulation in FACE©–Perspective (Facilitating Adjustment of Cognition and Emotion): Theory, Research and Practice. *Attention deficit hyperactivity disorder in children and adolescents* (2013), 243. doi:10.5772/54422

[17] Eun Kyoung Choe, Saeed Abdullah, Mashfiqui Rabbi, Edison Thomaz, Daniel A. Epstein, Felicia Cordeiro, Matthew Kay, Gregory D. Abowd, Tanzeem Choudhury, James Fogarty, Bongshin Lee, Mark Matthews, and Julie A. Kientz. 2017. Semi-Automated Tracking: A Balanced Approach for Self-Monitoring Applications. *IEEE Pervasive Computing* 16, 1 (2017), 74–84. doi:10.1109/MPRV.2017.18

[18] Nabila Chowdhury, Celine Latulipe, and James E. Young. 2021. Listening Together while Apart: Intergenerational Music Listening. In *Companion Publication of the 2021 Conference on Computer Supported Cooperative Work and Social Computing* (Virtual Event, USA) *(CSCW '21 Companion)*. Association for Computing Machinery, New York, NY, USA, 36–39. doi:10.1145/3462204.3481765

[19] Franceli L. Cibrian, Kimberley D. Lakes, Sabrina Schuck, Arya Tavakoulnia, Kayla Guzman, and Gillian Hayes. 2019. Balancing caregivers and children interaction to support the development of self-regulation skills using a smartwatch application. In *Adjunct Proceedings of the 2019 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2019 ACM International Symposium on Wearable Computers* (London, United Kingdom) *(UbiComp/ISWC '19 Adjunct)*. Association for Computing Machinery, New York, NY, USA, 459–460. doi:10.1145/3341162.3345612

[20] Franceli L. Cibrian, Kimberley D. Lakes, Arya Tavakoulnia, Kayla Guzman, Sabrina Schuck, and Gillian R. Hayes. 2020. Supporting Self-Regulation of Children with ADHD Using Wearables: Tensions and Design Challenges. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (, Honolulu, HI, USA,) *(CHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–13. doi:10.1145/3313831.3376837

[21] Stuart R. Cobb and Ceri H. Davies. 2013. Neurodevelopmental disorders. *Neuropharmacology* 68 (2013), 1. doi:10.1016/j.neuropharm.2013.02.001

[22] Nathalie Colineau and Cécile Paris. 2011. Motivating reflection about health within the family: the use of goal setting and tailored feedback. *User Modeling and User-Adapted Interaction* 21 (2011), 341–376. doi:10.1007/s11257-010-9089-x

[23] Melissa L Danielson, Rebecca H Bitsko, Reem M Ghandour, Joseph R Holbrook, Michael D Kogan, and Stephen J Blumberg. 2018. Prevalence of parent-reported ADHD diagnosis and associated treatment among US children and adolescents, 2016. *Journal of Clinical Child & Adolescent Psychology* 47, 2 (2018), 199–212.

[24] Max Doan, Franceli L. Cibrian, Agnes Jang, Nihar Khare, Sean Chang, Aiyuan Li, Sabrina Schuck, Kimberley D. Lakes, and Gillian R. Hayes. 2020. CoolCraig: A Smart Watch/Phone Application Supporting Co-Regulation of Children with ADHD. In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI EA '20)*. Association for Computing Machinery, New York, NY, USA, 1–7. doi:10.1145/3334480.3382991

[25] Inobat A Erina, Elena I Mychko, Yunna V Sorokopud, Irina S Karabulatova, and Maria A Streltsova. 2019. Development of communication skills in children with special needs (ADHD): Accentuation of the schoolboy's personality and

musical preferences. *Universal Journal of Educational Research* 7, 11 (2019), 2262–2269.
[26] Stephen V Faraone and Henrik Larsson. 2019. Genetics of attention deficit hyperactivity disorder. *Molecular psychiatry* 24, 4 (2019), 562–575.
[27] Christopher Frauenberger, Kay Kender, Laura Scheepmaker, Katharina Werner, and Katta Spiel. 2020. Desiging Social Play Things. In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society* (Tallinn, Estonia) *(NordiCHI '20)*. Association for Computing Machinery, New York, NY, USA, Article 24, 12 pages. doi:10.1145/3419249.3420121
[28] Radhika Garg. 2021. " Its Changes so Often": Parental Non-/Use of Mobile Devices While Caring for Infants and Toddlers at Home. *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW2 (2021), 1–26.
[29] Ron Gordon. 1983. The Effects of Perceived Mutual Understanding in Interpersonal Communication. (1983).
[30] Anthony M. Grant, John Franklin, and Peter Langford. 2002. The Self-Reflection and Insight Scale: A new measure of private self-consciousness. *Social Behavior and Personality: An International Journal* 30, 8 (2002), 821–835. doi:10.2224/sbp.2002.30.8.821
[31] Alexandra Harborne, Miranda Wolpert, and Linda Clare. 2004. Making sense of ADHD: a battle for understanding? Parents' views of their children being diagnosed with ADHD. *Clinical Child Psychology and Psychiatry* 9, 3 (2004), 327–339.
[32] Rick Harrington and Donald A Loffredo. 2010. Insight, rumination, and self-reflection as predictors of well-being. *The Journal of psychology* 145, 1 (2010), 39–57. doi:10.1080/00223980.2010.528072
[33] Ellen Isaacs, Artie Konrad, Alan Walendowski, Thomas Lennig, Victoria Hollis, and Steve Whittaker. 2013. Echoes from the past: how technology mediated reflection improves well-being. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (Paris, France) *(CHI '13)*. Association for Computing Machinery, New York, NY, USA, 1071–1080. doi:10.1145/2470654.2466137
[34] Jasmine Jones, David Merritt, and Mark S. Ackerman. 2017. KidKeeper: Design for Capturing Audio Mementos of Everyday Life for Parents of Young Children. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) *(CSCW '17)*. Association for Computing Machinery, New York, NY, USA, 1864–1875. doi:10.1145/2998181.2998348
[35] Kazi Sinthia Kabir, Ahmad Alsaleem, and Jason Wiese. 2021. The Impact of Spinal Cord Injury on Participation in Human-Centered Research. In *Proceedings of the 2021 ACM Designing Interactive Systems Conference* (Virtual Event, USA) *(DIS '21)*. Association for Computing Machinery, New York, NY, USA, 1902–1914. doi:10.1145/3461778.3462122
[36] CLM Keyes. 2014. Bridging occupational, organizational and public health. *Netherlands: Springer Dordrecht* (2014).
[37] Corey LM Keyes. 2006. Mental health in adolescence: is America's youth flourishing? *American journal of orthopsychiatry* 76, 3 (2006), 395–402. doi:10.1037/0002-9432.76.3.395
[38] Sofia Kouvava, Katerina Antonopoulou, Constantinos M Kokkinos, Asimina M Ralli, and Katerina Maridaki-Kassotaki. 2022. Friendship quality, emotion understanding, and emotion regulation of children with and without attention deficit/hyperactivity disorder or specific learning disorder. *Emotional and behavioural difficulties* 27, 1 (2022), 3–19.
[39] Kevin R Krull and Eugenia Chan. 2019. Attention deficit hyperactivity disorder in children and adolescents: Clinical features and diagnosis. *UpToDate, Waltham MA. Accessed April* 29 (2019).
[40] Bettina Laugwitz, Theo Held, and Martin Schrepp. 2008. Construction and Evaluation of a User Experience Questionnaire, In HCI and Usability for Education and Work. *USAB 2008* 5298, 63–76. doi:10.1007/978-3-540-89350-9_6
[41] Sonja Lyubomirsky, Kennon M Sheldon, and David Schkade. 2005. Pursuing happiness: The architecture of sustainable change. *Review of general psychology* 9, 2 (2005), 111–131. doi:10.1037/1089-2680.9.2.111
[42] Kelly Mack, Emma McDonnell, Venkatesh Potluri, Maggie Xu, Jailyn Zabala, Jeffrey Bigham, Jennifer Mankoff, and Cynthia Bennett. 2022. Anticipate and Adjust: Cultivating Access in Human-Centered Methods. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 603, 18 pages. doi:10.1145/3491102.3501882
[43] David Merritt, Jasmine Jones, Mark S. Ackerman, and Walter S. Lasecki. 2017. Kurator: Using The Crowd to Help Families With Personal Curation Tasks. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) *(CSCW '17)*. Association for Computing Machinery, New York, NY, USA, 1835–1849. doi:10.1145/2998181.2998358
[44] Antigoni Mertika, Paschalia Mitskidou, and Anastassios Stalikas. 2020. "Positive Relationships" and their impact on wellbeing: A review of current literature. *Psychology: the Journal of the Hellenic Psychological Society* 25, 1 (2020), 115–127.
[45] Stephanie SJ Morris, Erica D Musser, Rachel B Tenenbaum, Anthony R Ward, Jessica Martinez, Joseph S Raiker, Erika K Coles, and Cameron Riopelle. 2020. Emotion regulation via the autonomic nervous system in children with attention-deficit/hyperactivity disorder (ADHD): replication and extension. *Journal of abnormal child psychology* 48 (2020), 361–373.

[46] Elizabeth L. Murnane, Jaime Snyder, Stephen Voida, Matthew J. Bietz, Mark Matthews, Sean Munson, and Laura R. Pina. 2018. Social Issues in Personal Informatics: Design, Data, and Infrastructure. In *Companion of the 2018 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Jersey City, NJ, USA) *(CSCW '18 Companion)*. Association for Computing Machinery, New York, NY, USA, 471–478. doi:10.1145/3272973.3273016

[47] Sarah Nikkhah. 2021. Family Resilience Technologies: Designing Collaborative Technologies for Caregiving Coordination in the Children's Hospital. In *Companion Publication of the 2021 Conference on Computer Supported Cooperative Work and Social Computing* (Virtual Event, USA) *(CSCW '21 Companion)*. Association for Computing Machinery, New York, NY, USA, 279–282. doi:10.1145/3462204.3481794

[48] Sarah Nikkhah, Swaroop John, Krishna Supradeep Yalamarti, Emily L. Mueller, and Andrew D. Miller. 2021. Helping Their Child, Helping Each Other: Parents' Mediated Social Support in the Children's Hospital. In *Companion Publication of the 2021 Conference on Computer Supported Cooperative Work and Social Computing* (Virtual Event, USA) *(CSCW '21 Companion)*. Association for Computing Machinery, New York, NY, USA, 140–143. doi:10.1145/3462204.3481759

[49] Işil Oygür, Daniel A. Epstein, and Yunan Chen. 2020. Raising the Responsible Child: Collaborative Work in the Use of Activity Trackers for Children. *Proc. ACM Hum.-Comput. Interact.* 4, CSCW2, Article 157 (oct 2020), 23 pages. doi:10.1145/3415228

[50] James W. Pennebaker, Emmanuelle Zech, and Bernard Rimé. 2001. Disclosing and sharing emotion: Psychological, social and health consequences. 517–539. doi:10.1037/10436-022

[51] Sören Petermann. 2019. Wie geht's dir, UWE?: Monitoring von Umwelt, Wohlbefinden und Entwicklung von Kindern und Jugendlichen im Sekundarschulalter als Grundlage einer integrierenden Stadtentwicklung. Ergebnisse der UWE-Pilotstudie 2017 in Herne. (2019).

[52] Daniela Petrelli and Steve Whittaker. 2010. Family memories in the home: contrasting physical and digital mementos. *Personal and Ubiquitous Computing* 14 (2010), 153–169.

[53] Maria João Pimentel, Salomé Vieira-Santos, Vanessa Santos, and Maria Carmo Vale. 2011. Mothers of children with attention deficit/hyperactivity disorder: relationship among parenting stress, parental practices and child behaviour. *ADHD Attention Deficit and Hyperactivity Disorders* 3, 1 (2011), 61–68.

[54] Laura Pina, Kael Rowan, Asta Roseway, Paul Johns, Gillian R. Hayes, and Mary Czerwinski. 2014. In situ cues for ADHD parenting strategies using mobile technology. In *Proceedings of the 8th International Conference on Pervasive Computing Technologies for Healthcare* (Oldenburg, Germany) *(PervasiveHealth '14)*. ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering), Brussels, BEL, 17–24. doi:10.4108/icst.pervasivehealth.2014.254958

[55] Laura Pina, Sang-Wha Sien, Clarissa Song, Teresa M Ward, James Fogarty, Sean A Munson, and Julie A Kientz. 2020. DreamCatcher: exploring how parents and school-age children can track and review sleep information together. *Proceedings of the ACM on Human-computer Interaction* 4, CSCW1 (2020), 1–25.

[56] Laura R. Pina, Sang-Wha Sien, Teresa Ward, Jason C. Yip, Sean A. Munson, James Fogarty, and Julie A. Kientz. 2017. From Personal Informatics to Family Informatics: Understanding Family Practices around Health Monitoring. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) *(CSCW '17)*. Association for Computing Machinery, New York, NY, USA, 2300–2315. doi:10.1145/2998181.2998362

[57] Robert Reid, Alexandra L Trout, and Michalla Schartz. 2005. Self-regulation interventions for children with attention deficit/hyperactivity disorder. *Exceptional Children* 71, 4 (2005), 361.

[58] Kelly Richards, C Campenni, and Janet Muse-Burke. 2010. Self-care and well-being in mental health professionals: The mediating effects of self-awareness and mindfulness. *Journal of Mental Health Counseling* 32, 3 (2010), 247–264. doi:10.17744/mehc.32.3.0n31v88304423806

[59] Olivia K. Richards. 2022. Understanding and Designing Technologies for Family Health Routines: Supporting Children in the Digital Age. In *Companion Publication of the 2022 Conference on Computer Supported Cooperative Work and Social Computing* (Virtual Event, Taiwan) *(CSCW'22 Companion)*. Association for Computing Machinery, New York, NY, USA, 228–231. doi:10.1145/3500868.3561401

[60] Olivia K. Richards, Adrian Choi, and Gabriela Marcu. 2021. Shared Understanding in Care Coordination for Children's Behavioral Health. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW1, Article 21 (apr 2021), 25 pages. doi:10.1145/3449095

[61] Perou Ruth, Bitsko H Rebecca, Blumberg J Stephen, Pastor Patricia, Ghandour M Reem, Gfroerer C Joseph, Hedden L Sarra, Crosby E Alex, Visser N Susanna, Schieve A Laura, Parks E Sharyn, Hall E Jeffery, Brody Debra, Simile M Catherine, Thompson W William, Baio Jon, Avenevoli Shelli, Kogan D Michael, Huang N Larke, Centers for Disease Control, and Prevention (CDC). 2013. Mental health surveillance among children–United States, 2005-2011. *MMWR Surveill Summ 62 Suppl 2: 1–35* (2013).

[62] Herman Saksono, Carmen Castaneda-Sceppa, Jessica Hoffman, Vivien Morris, Magy Seif El-Nasr, and Andrea G. Parker. 2020. Storywell: Designing for Family Fitness App Motivation by Using Social Rewards and Reflection. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI '20)*. Association for Computing Machinery, New York, NY, USA, 1–13. doi:10.1145/3313831.3376686

[63] Herman Saksono, Ashwini Ranade, Geeta Kamarthi, Carmen Castaneda-Sceppa, Jessica A. Hoffman, Cathy Wirth, and Andrea G. Parker. 2015. Spaceship Launch: Designing a Collaborative Exergame for Families. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing* (Vancouver, BC, Canada) *(CSCW '15)*. Association for Computing Machinery, New York, NY, USA, 1776–1787. doi:10.1145/2675133.2675159

[64] Christine Satchell and Paul Dourish. 2009. Beyond the user: use and non-use in HCI. In *Proceedings of the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group: Design: Open 24/7* (Melbourne, Australia) *(OZCHI '09)*. Association for Computing Machinery, New York, NY, USA, 9–16. doi:10.1145/1738826.1738829

[65] Christopher L. Schaefbauer, Danish U. Khan, Amy Le, Garrett Sczechowski, and Katie A. Siek. 2015. Snack Buddy: Supporting Healthy Snacking in Low Socioeconomic Status Families. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing* (Vancouver, BC, Canada) *(CSCW '15)*. Association for Computing Machinery, New York, NY, USA, 1045–1057. doi:10.1145/2675133.2675180

[66] Kimberly A Schonert-Reichl, Martin Guhn, Anne M Gadermann, Shelley Hymel, Lina Sweiss, and Clyde Hertzman. 2013. Development and validation of the Middle Years Development Instrument (MDI): Assessing children's well-being and assets across multiple contexts. *Social indicators research* 114 (2013), 345–369. doi:10.1007/s11205-012-0149-y

[67] Neil Selwyn. 2003. Apart from technology: understanding people's non-use of information and communication technologies in everyday life. *Technology in society* 25, 1 (2003), 99–116.

[68] Philip Shaw, Argyris Stringaris, Joel Nigg, and Ellen Leibenluft. 2016. Emotion dysregulation in attention deficit hyperactivity disorder. *Focus* 14, 1 (2016), 127–144.

[69] Ji Youn Shin, Minjin Rheu, Jina Huh-Yoo, and Wei Peng. 2021. Designing Technologies to Support Parent-Child Relationships: A Review of Current Findings and Suggestions for Future Directions. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW2, Article 441 (oct 2021), 31 pages. doi:10.1145/3479585

[70] Lucas M. Silva, Franceli L. Cibrian, Elissa Monteiro, Arpita Bhattacharya, Jesus A. Beltran, Clarisse Bonang, Daniel A. Epstein, Sabrina E. B. Schuck, Kimberley D. Lakes, and Gillian R. Hayes. 2023. Unpacking the Lived Experiences of Smartwatch Mediated Self and Co-Regulation with ADHD Children. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI '23)*. Association for Computing Machinery, New York, NY, USA, Article 90, 19 pages. doi:10.1145/3544548.3581316

[71] Petr Slovák, Nikki Theofanopoulou, Alessia Cecchet, Peter Cottrell, Ferran Altarriba Bertran, Ella Dagan, Julian Childs, and Katherine Isbister. 2018. " I just let him cry... Designing Socio-Technical Interventions in Families to Prevent Mental Health Disorders. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (2018), 1–34.

[72] Tobias Sonne and Mads Møller Jensen. 2016. ChillFish: A Respiration Game for Children with ADHD. In *Proceedings of the TEI '16: Tenth International Conference on Tangible, Embedded, and Embodied Interaction* (Eindhoven, Netherlands) *(TEI '16)*. Association for Computing Machinery, New York, NY, USA, 271–278. doi:10.1145/2839462.2839480

[73] Tobias Sonne and Mads Møller Jensen. 2016. Evaluating the ChillFish Biofeedback Game with Children with ADHD. In *Proceedings of the The 15th International Conference on Interaction Design and Children* (Manchester, United Kingdom) *(IDC '16)*. Association for Computing Machinery, New York, NY, USA, 529–534. doi:10.1145/2930674.2935981

[74] Tobias Sonne, Jörg Müller, Paul Marshall, Carsten Obel, and Kaj Grønbæk. 2016. Changing Family Practices with Assistive Technology: MOBERO Improves Morning and Bedtime Routines for Children with ADHD. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (San Jose, California, USA) *(CHI '16)*. Association for Computing Machinery, New York, NY, USA, 152–164. doi:10.1145/2858036.2858157

[75] Katta Spiel and Kathrin Gerling. 2021. The Purpose of Play: How HCI Games Research Fails Neurodivergent Populations. *ACM Transactions on Computer-Human Interaction (TOCHI)* 28, 2 (2021), 1–40.

[76] Katta Spiel, Eva Hornecker, Rua Mae Williams, and Judith Good. 2022. ADHD and Technology Research – Investigated by Neurodivergent Readers. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 547, 21 pages. doi:10.1145/3491102.3517592

[77] Evropi Stefanidi, Julia Dominiak, Marit Bentvelzen, Paweł W. Woźniak, Johannes Schöning, Yvonne Rogers, and Jasmin Niess. 2023. MagiBricks: Fostering Intergenerational Connectedness in Distributed Play with Smart Toy Bricks. In *Proceedings of the 22nd Annual ACM Interaction Design and Children Conference* (Chicago, IL, USA) *(IDC '23)*. Association for Computing Machinery, New York, NY, USA, 239–252. doi:10.1145/3585088.3589390

[78] Evropi Stefanidi, Johannes Schöning, Sebastian S. Feger, Paul Marshall, Yvonne Rogers, and Jasmin Niess. 2022. Designing for Care Ecosystems: a Literature Review of Technologies for Children with ADHD. In *Proceedings of the 21st Annual ACM Interaction Design and Children Conference* (Braga, Portugal) *(IDC '22)*. Association for Computing Machinery, New York, NY, USA, 13–25. doi:10.1145/3501712.3529746

[79] Evropi Stefanidi, Johannes Schöning, Yvonne Rogers, and Jasmin Niess. 2023. Children with ADHD and their Care Ecosystem: Designing Beyond Symptoms. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI '23)*. Association for Computing Machinery, New York, NY, USA, Article 558, 17 pages. doi:10.1145/3544548.3581216

[80] Evropi Stefanidi, Jonathan L.B Wassmann, Paweł W. Woźniak, Gunnar Spellmeyer, Yvonne Rogers, and Jasmin Niess. 2024. MoodGems: Designing for theWell-being of Children with ADHD and their Families at Home. In *Proceedings of the 23rd Annual ACM Interaction Design and Children Conference (IDC '24)*. Association for Computing Machinery, New York, NY, USA, 15 pages. doi:10.1145/3628516.3655795

[81] Molly M Stevens, Gregory D Abowd, Khai N Truong, and Florian Vollmer. 2003. Getting into the Living Memory Box: Family archives & holistic design. *Personal and Ubiquitous Computing* 7 (2003), 210–216.

[82] Richard L Street Jr, Gregory Makoul, Neeraj K Arora, and Ronald M Epstein. 2009. How does communication heal? Pathways linking clinician–patient communication to health outcomes. *Patient education and counseling* 74, 3 (2009), 295–301.

[83] Jennifer Theule, Judith Wiener, Rosemary Tannock, and Jennifer M Jenkins. 2013. Parenting Stress in Families of Children With ADHD: A Meta-Analysis. *Journal of Emotional and Behavioral Disorders* 21, 1 (2013), 3–17. doi:10.1177/1063426610387433

[84] Orad Weisberg, Ayelet GalOz, Ruth Berkowitz, Noa Weiss, Oran Peretz, Shlomi Azoulai, Daphne KoplemanRubin, and Oren Zuckerman. 2014. TangiPlan: designing an assistive technology to enhance executive functioning among children with adhd. In *Proceedings of the 2014 Conference on Interaction Design and Children* (Aarhus, Denmark) *(IDC '14)*. Association for Computing Machinery, New York, NY, USA, 293–296. doi:10.1145/2593968.2610475

[85] David West, Aaron Quigley, and Judy Kay. 2007. MEMENTO: a digital-physical scrapbook for memory sharing. *Personal and Ubiquitous Computing* 11 (2007), 313–328.

[86] Sally ME Wyatt. 2003. Non-users also matter: The construction of users and non-users of the Internet. *Now users matter: The co-construction of users and technology* (2003), 67–79.

[87] Fei Xie and Ali Derakhshan. 2021. A conceptual review of positive teacher interpersonal communication behaviors in the instructional context. *Frontiers in psychology* 12 (2021), 708490.

[88] Naomi Yamashita, Hideaki Kuzuoka, Takashi Kudo, Keiji Hirata, Eiji Aramaki, and Kazuki Hattori. 2018. How Information Sharing about Care Recipients by Family Caregivers Impacts Family Communication. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC, Canada) *(CHI '18)*. Association for Computing Machinery, New York, NY, USA, 1–13. doi:10.1145/3173574.3173796

[89] Nathan D Zasler, Michael F Martelli, and Harvey E Jacobs. 2013. Neurobehavioral disorders. *Handbook of clinical neurology* 110 (2013), 377–388.

[90] Oren Zuckerman. 2015. Objects for Change: A Case Study of a Tangible User Interface for Behavior Change. In *Proceedings of the Ninth International Conference on Tangible, Embedded, and Embodied Interaction* (Stanford, California, USA) *(TEI '15)*. Association for Computing Machinery, New York, NY, USA, 649–654. doi:10.1145/2677199.2687906

[91] Oren Zuckerman, Ayelet Gal-Oz, Neta Tamir, and Daphne Kopelman-Rubin. 2015. Initial validation of an assistive technology to enhance executive functioning among children with ADHD. In *Proceedings of the 14th International Conference on Interaction Design and Children* (Boston, Massachusetts) *(IDC '15)*. Association for Computing Machinery, New York, NY, USA, 299–302. doi:10.1145/2771839.2771901

A Example Screens from REMEMO's Iterative Design and Evaluation

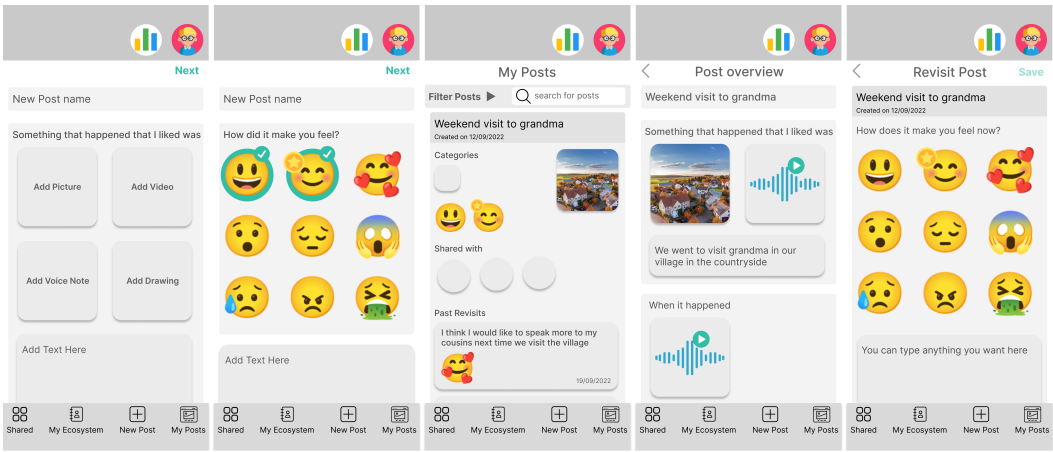

Fig. 5. Example screens from the first iteration for the children's UI (medium fidelity mock-ups). a) Post creation first question "Something that happened that I liked was", being able to add pictures, videos, voice notes, drawing, and/or text. b) Post creation question about emotions: "How did it make you feel?" with one or more emojis and/or text, c) Viewing "My Posts", d) Viewing details on the own post of a user, e) Revisiting a post, by answering "How does it make you feel now" with one or more emojis and/or text.

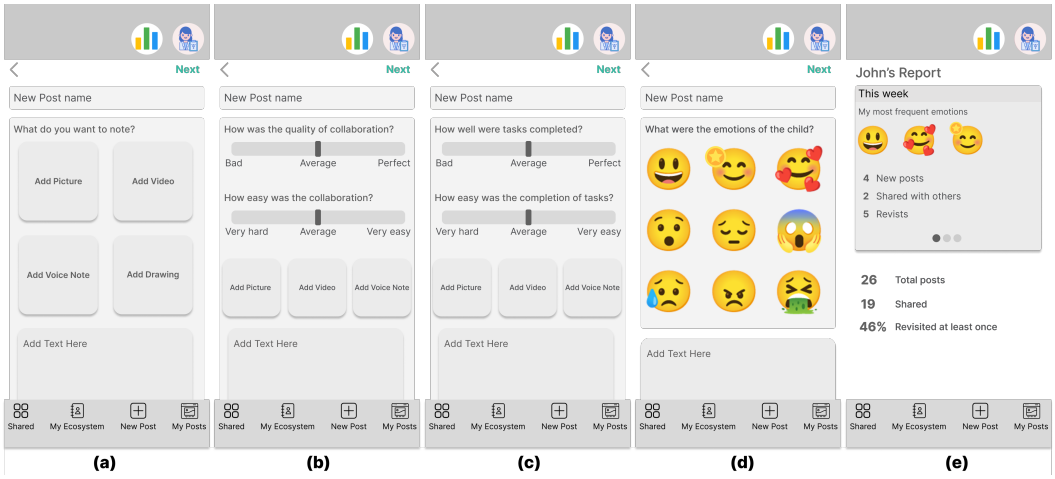

Fig. 6. Example screens from the first iteration for the therapists' UI (medium fidelity mock-ups). a) Post creation for therapists, being able to add pictures, videos, voice notes, drawings, and/or text. b) Filling out questions about the therapist's collaboration with the child during a session, with the previous media choices as well as sliders, c) Filling out questions about task completion by the child with the previous media choices as well as sliders, d) Answering "What were the emotions of the child?" with one or more emojis and/or text, e) Profile page of the child with statistics about their use of the app.

Received January 2024; revised July 2024; accepted October 2024

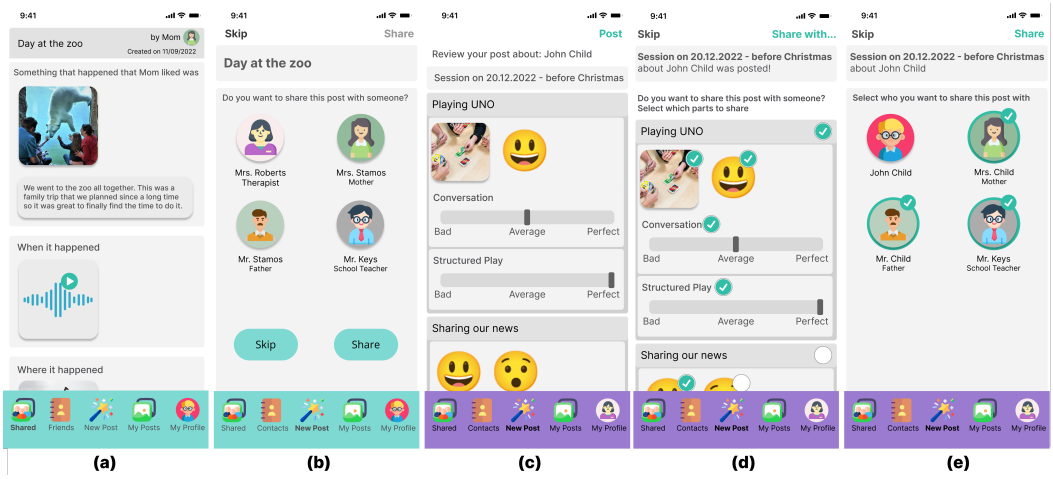

Fig. 7. Example screens from the second iteration for the children's UI (first two screens) and the therapists' UI (last three screens), based on the first formative evaluation. a) Details on the post that someone shared with the child, b) Choosing whether to share the post with a member of the care ecosystem, c) Reviewing post (updated contents) before posting it, d) Selecting which aspects of the post to share, e) Selecting members of the care ecosystem to share the post.