Embedding technology-assisted parenting interventions in real-world settings to empower parents of children with adverse childhood experiences: A co-design study.

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Table of Contents

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Abstract

Background: Adverse childhood experiences (ACEs) are strongly associated with mental disorders in young people. Parenting programs are available through community health settings, and can intervene with ACEs that are within a parent's capacity to modify. Technology can minimise common barriers associated with engaging in face-to-face parenting programs. However, families experiencing adversity face unique barriers to engaging with technology-assisted parenting programs. Formative research using co-design methodology to provide a deep contextual understanding of these barriers can help overcome unique barriers and ensure these families can capitalise on the benefits of technology-assisted parenting programs.

Objective: This study aimed to innovate the parenting support delivered by a community health and social service with technology, by adapting an existing, evidence-based technology-assisted parenting intervention.

Methods: Staff (n = 3) participated in dialogues (n = 2) and co-design workshops (n = 8) exploring needs and preferences for a technology-assisted parenting intervention, and iteratively developing a prototype intervention ('PaRK-Lite'). Parents (n = 3) received PaRK-Lite and participated in qualitative interviews to provide feedback on their experience and PaRK-Lite's design.

Results: PaRK-Lite's hybrid design leverages simple and familiar modes of technology (podcasts) to deliver intervention content and embeds reflective practice into service provision (micro-coaching) to enhance parents' empowerment and reduce service dependency. A training session, manuals, session plans and templates were also developed to support the delivery of micro-coaching. Feedback data from parents overall indicated that PaRK-Lite met their needs, suggesting service providers can play a key role in early phases of service innovation for parents.

Conclusions: The co-designed technology-assisted parenting intervention aims to offer both parents and clinicians a novel and engaging resource for intervening with maladaptive parenting, contributing to efforts to respond to childhood adversity and improve child mental health. Future research in the field of human-computer interaction and health service design can consider our findings in creating engaging interventions that have a positive impact on the well-being of children and families.

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ABSTRACT

Background: Adverse childhood experiences (ACEs) are strongly associated with mental disorders in young people. Parenting programs are available through community health settings, and can intervene with ACEs that are within a parent's capacity to modify. Technology can minimise common barriers associated with engaging in face-to-face parenting programs. However, families experiencing adversity face unique barriers to engaging with technology-assisted parenting programs. Formative research using co-design methodology to provide a deep contextual understanding of these barriers can help overcome unique barriers and ensure these families can capitalise on the benefits of technology-assisted

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Conclusions: The co-designed technology-assisted parenting intervention aims to offer both parents and clinicians a novel and engaging resource for intervening with maladaptive parenting, contributing to efforts to respond to childhood adversity and improve child mental health. Future research in the field of human-computer interaction and health service design can consider our findings in creating engaging interventions that have a positive impact on the well-being of children and families.

Funding information: This project is affiliated with The Centre of Research Excellence in Childhood Adversity and Mental Health, a five-year research program (2019-2023) co-funded by the National Health and Medical Research Council (NHMRC) and Beyond Blue. Aldridge is funded by the Research Training Program Scholarship (Monash University). Aldridge has also been awarded a top-up scholarship from the NHMRC Centres of Research Excellence Grant APP1153419 titled 'Centre of Research Excellence in Childhood Adversity and Associated Depression and Anxiety'.

INTRODUCTION

Maladaptive parenting is an Adverse Childhood Experience (ACE) and risk factor for internalising problems in children

The incidence of mental disorders in young people is strongly associated with adverse childhood experiences (ACEs) [1,2]. Unlike many community or society-level ACEs, maladaptive parenting is an ACE that is potentially within a parent's capacity to modify. Evidence-based parenting programs designed to intervene with maladaptive parenting hold clear potential for preventing or reducing the impact of such ACEs and protecting young people from the risk of mental disorders. However,

barriers to engaging in parenting programs and services are especially prevalent for families who experience adversity, marginalisation and stress due to socio-economic disadvantage [3,4]. Technology has the potential to minimise or overcome common barriers associated with engaging in face-to-face parenting programs, such as time constraints and competing demands, and can hence help expand reach and improve cost effectiveness of parenting programs [5]. Given program engagement is a key mechanism for improving target behaviour [6,7], understanding factors that influence program engagement through formative research is critical to ensure families experiencing adversity can capitalise on the benefits of technology-assisted parenting programs.

The role of technology in promoting engagement with programs and services

There is a body of evidence supporting the efficacy of technology-assisted parenting programs on improving parenting outcomes (including maladaptive parenting behaviours) and reducing child internalising problems [8,9], externalising problems [10–12], and promoting child physical and mental health [13]. Importantly, these programs have also been found to be efficacious for families experiencing adversities such as socio-economic disadvantage [14].

Technology-assisted interventions are also easier to scale compared to face-to-face programs, enhancing cost-effectiveness, long-term feasibility, and importantly in reaching families experiencing socio-economic stress or disadvantage [15]. In Australia, some local councils and community service organisations offer evidence-based parenting interventions designed to reduce the occurrence of ACEs in children and/or reduce their impact on mental health during or after childhood [16]. There is therefore clear potential for these services to embrace and implement technology-assisted parenting programs to enhance available parenting support. However, mainstream uptake of technology to deliver child and youth mental health care has historically been limited due to concerns relating to authenticity, privacy, security, access and risk [17]. Further, parents experiencing socio-economic disadvantage face unique barriers to engaging with technology-assisted programs, such as lower

digital literacy [18] and more limited access to devices [19], which can result in parents lacking confidence in navigating digital resources [20]. Embracing technology-assisted parenting programs in these settings to capitalise on their benefits thus requires a deep contextual understanding to ensure such needs and constraints are accounted for in the design of these programs.

Learning from practitioners' experience of using technology in service delivery during COVID-19

An additional barrier to parents' uptake and retention of innovative programs can be the program practitioners' low motivation or stress around delivering it due to difficulties with its implementation [21,22]. Practitioners are more likely to adopt an innovative program when its design accounts for their needs and perspectives on delivering innovations, reflects a shared understanding of its meaning and value, and involves fewer changes to existing practices [23]. For instance, public health measures implemented to manage the COVID-19 pandemic (including stay-at-home orders, curfews, and closure of all nonessential services, schools and childcare) necessitated a rapid transition to technology-assisted modalities in order to facilitate ongoing access to and engagement in health and social care services. Indeed, practitioner skills and attitudes towards technology-assisted modalities used during COVID-19 were vital to the successful implementation of any service provided [24], consistent with past research linking acceptance of technology with users' perceived competence and sense of achievement while using it [25]. Involving practitioners in the design of an innovation is thus critical for increasing the likelihood of them adopting innovative, technology-assisted parenting programs and in turn improving parents' engagement with these programs.

Innovating programs

Innovating and tailoring evidence-based programs for different service contexts inevitably leads to differences from a program's original design. To ensure innovations to evidence-based programs can still be monitored for fidelity and rigorously evaluated, Greenhalgh and colleagues suggest

embedding ‘hard cores’ (non-negotiable components, such as evidence-based content) in ‘soft peripheries’ (contextual structures and systems required for full implementation, such as human resources and technology platforms for delivery) [23]. 'Soft peripheries’ may thus represent the design space for innovation. A common challenge in co-designing innovations stems from the additional time required to iteratively explore and test concepts [26]. There is thus a need to investigate methods that minimise the burden on co-designers, such as considering how different stakeholders might design points on the client journey as opposed to the whole journey [27]. Practitioners hold specialised knowledge about a service’s contextual structures and systems that can be feasibly adapted, hence they are best placed to first determine the range of program features that could feasibly be implemented and co-develop prototype innovations. Further, since practitioners’ role primarily involves supporting and advocating for the needs of families whose children experience adversity, their insight into the lived experience of these families can be leveraged during this process. It is nevertheless critical to involve program users in a design process, however for families experiencing socio-economic disadvantage and stress, such involvement may place further pressure on already-limited resources. However, this can be overcome by delivering prototype innovations to these families as part of an iterative co-design process, to obtain experience-based feedback to understand which features are most accessible and engaging [20], while simultaneously offering families benefit through accessing additional support to what they might usually receive.

Innovating Parenting Resilient Kids (PaRK)

Parenting Resilient Kids (PaRK) is a web-based preventive parenting intervention designed to support parents in implementing evidence-based parenting strategies to reduce their child’s risk of depression or anxiety problems [28]. The program content is derived from high-quality research evidence and international expert consensus on parenting risk and protective factors for child internalising disorders [29,30]. Findings from a randomised controlled trial comparing PaRK to an active control demonstrated that PaRK was significantly more effective in improving self-reported

parenting behaviours [31], including maladaptive parenting behaviours [2,31,32]. These effects were also significantly associated with parental engagement with the program [33]; consistent with the notion that program engagement is a key mechanism for target behaviour change [7]. PaRK thus has potential to serve as a tool or intervention pathway to help improve outcomes for families accessing community service organisations that offer evidence-based parenting interventions designed to reduce the occurrence of ACEs.

In PaRK's original format, parents receive: a) evidence-based parenting guidelines [34], b) a self-assessment tool with individualised written feedback on their parenting strengths and areas for further development [32], and c) up to 12 interactive, self-directed online modules covering different domains of parenting that evidence indicates are associated with child mental health, unlocked on a weekly basis [28]. PaRK's 'hard cores' thus comprise the evidence-based parenting guidelines which underpin the key messages in the self-assessment tool, individualised feedback, and module content. Prior research with parents experiencing socio-economic disadvantage has suggested that simple, easy-to-understand language (as parents from these communities are likely to possess greater linguistic diversity and lower literacy), easy-to-navigate user interfaces, and flexible program navigation as program features that are important for these parents' engagement in technology-assisted parenting programs [20]. Such features represent the 'soft peripheries' of PaRK that should be explored with service providers and parents whose children experience adversity, to inform how they may best be adapted or re-designed to meet their needs.

The current study

The aim of this study was to innovate a community health and social service's parenting support with technology by adapting PaRK. Specifically, this study aimed to use co-design activities to: a) understand the needs and preferences of service providers (who provide support to parents of children who have experienced ACEs) when it comes to delivering a technology-assisted parenting program (PaRK) in their service context, b) design and develop a prototype parenting support (using

PaRK) for the health service, c) deliver the prototype to parents, and d) understand how its design met parents' needs and preferences for the adoption of PaRK and if further adaptations are needed.

METHODS AND RESULTS

Study setting

This study was affiliated with a larger research program conducted by the Centre for Research Excellence in Childhood Adversity and Mental Health. It was conducted in the City of Brimbank, a local government area (LGA) of Greater Metropolitan Melbourne, Victoria, Australia that is culturally diverse and experiences greater socio-economic disadvantage and a substantially higher proportion of developmentally vulnerable children compared to Greater Metropolitan Melbourne [35]. We partnered with a large, multi-site provider of community health services within the City of Brimbank and other culturally diverse LGAs with higher concentrations of socio-economic disadvantage. This community health service provides *Family Services*, a free, state-wide, first port-of-call service for families who have experienced or are at risk of experiencing adversity or becoming involved with Child Protection (Victoria's state-wide service for children and young people who have experienced significant harm within the family). *Family Services* comprises two service elements: *Medium-term Casework*, in which a family receives a comprehensive needs and risk assessment and multidisciplinary intervention responses (such as therapeutic home-based interventions, advocacy, crisis intervention, counselling); and *Active Holding Responses*, in which a family receives low-level monitoring and support until allocated to a caseworker, or short-term intervention that could lead to case closure. Given this study's focus on promoting parenting programs to prevent or reduce the risk of ACEs, the Family Services program was identified as an appropriate design space in the community health service.

Recruitment

This study and its output is the first iteration of a larger design process guided by the Double Diamond model [36]. Designing, developing and piloting a minimum viable product is considered a cost- and time- efficient way of designing scalable and sustainable health services, especially in low-income regions [37]. A small sample size is considered appropriate for a small-scale qualitative pilot study such as this [38], especially when in-depth exploration that involves deep, case-oriented analysis is used as the primary method for design enquiry [39]. We therefore engaged a small number of service providers to gain in-depth understanding of their service provision at this initial stage, and strategically engaging parents at times of necessity. Results from this small-scale study will support and guide future, larger-scale iterations, until the intervention is sufficiently refined to be implemented at scale.

Service providers. Eligible service providers were identified by the *Family Services* Manager, who acted as the link between researchers and community health service clinicians throughout the study. An email including an online flyer was sent to eligible staff, and any interested staff contacted the first author directly to express their interest and provide consent. The researcher organised brief meetings with interested staff to provide further information and address any questions about the research. All research activities took place during service providers' rostered hours, so involvement was logged as program development.

Parents. Parents living in Wyndham with children aged 4-11 years were invited to receive the co-designed program, then participate in an interview to provide feedback on their experience. Parents were recruited via two methods: 1) Family Services practitioners working with parents of children aged 4-11 were sent a study flyer for parents, and were invited to pass the flyer onto parents who were eligible and potentially interested in receiving parenting support, and; 2) parents who have been involved in prior research projects occurring at the community health service and who indicated an interest in future research projects occurring as part of the Centre for Research Excellence in Childhood Adversity and Mental Health were emailed a study flyer, and were invited to directly

email the first author to express their interest. Parents were reimbursed A$35 for each hour spent engaged with the program and feedback interview.

Ethical approval

The study protocol and procedures were approved by Monash University Human Research Ethics Committee (project number: 28222). Each participant was provided with an Explanatory Statement and opportunity to ask questions about their involvement before providing consent to participate.

Study design

The co-design process for this study was guided by the '*Double Diamond*' design model [36]. The first diamond's aim is to *Discover* and *Define* the design problem, and the second diamond's aim is to *Develop* and *Deliver* possible solutions [36].

Phase 1 of this study involved dialogues and co-design workshops to '*Discover'* and '*Define'* design problems and the design space for a technology-assisted parenting intervention with service providers. This phase conducted while Melbourne's 2021 COVID-19 lockdown restrictions were in place. As these restrictions placed additional stress on service providers who were in the process of pivoting to technology and working from home while supporting vulnerable families, we selected co-design methods that placed minimal time and cognitive burden on service providers while providing the researchers with substantial experience-based insights to leverage the design process. Phase 2 involved co-design workshops to '*Develop'* prototype solutions with service providers. Phase 3 involved piloting the prototype to '*Deliver'* it to parents and conducting qualitative feedback interviews to inform the next iteration of development, reflecting the framework's core principle of iteration. A summary of co-design methods and aims can be found in Supplementary File 1. The remainder of this section reports methodological details and results of each Phase.

Phase 1: Identify design problem and space

Dialogues

Participants

Service provider participants (n=2) were aged 18 years or older, and held tertiary-level Social Work qualifications. One service provider provided *Medium-Term Casework*, while the other provided *Active Holding Responses*, hence between them the two service elements in Family Services were covered.

Methods

Both dialogues were conducted in individual formats during July 2021. One was conducted face-to-face (on the day before lockdown restrictions were introduced in Melbourne, Victoria) and the other was conducted via Zoom as COVID-19 restrictions prevented face-to-face meetings. Dialogues lasted for 2 hours (including a 10-minute break) and followed an unstructured format to enable free flow of conversation. 'Horizontal' questions were used by the researcher to understand the range of service providers' experiences (i.e. who, what, where, how) and 'Vertical' questions were used to uncover root causes or deeper beliefs underpinning service providers' experiences or ideas about using technology. The first author also used verbal and visual methods to take notes, where visual methods such as sketching prompted deeper thinking about conceptual relationships. A relational approach to communication was fostered as service providers' knowledge and identity became associated with the researcher's empathy and active listening.

Data handling, analysis and prioritisation

Dialogue recordings were transcribed verbatim by an automatic AI transcription service ('Descript') and cleaned by the first author. Content analysis was used to code according to an '*empathy map*', i.e. what service providers '*do, say, think and feel*' for the researcher to empathically understand service providers' experience. Aspects of the service providers' experiences were also deductively

coded as '*surprising, insightful, curious to know more about*', for the researcher to consider in designing subsequent co-design workshops. Common themes between service providers were coded and summarised into key design considerations, described below.

Results

Dialogue theme 1: *Parent vulnerability interferes with confidence and motivation to engage*

Participants discussed parents' vulnerability upon entering Family Services due to fear that Child Protection could become involved or fear of stigma from needing help, and/or additional stressors such as mental health problems, family violence, and financial stressors (many of which were exacerbated by COVID-19 lockdowns and requirements to provide homeschooling to children) interfering with their confidence and motivation to keep trying new parenting strategies. They wondered whether this vulnerability might prevent parents from maximising available resources and interventions.

> "*A lot of the clients we have are from disadvantaged backgrounds where they are probably been treated like they are not the experts in anything…and if they've been in abusive relationships, they probably have been told that they don't know anything*." (SP2)

Dialogue theme 2: Service providers miss early intervention parenting work

At the time of the dialogues, Family Services were transitioning to a service structure change which resulted in changes to common family presentations (i.e. families with more complex needs), meaning less time was available for early intervention work.

> "*-we're having a lot more Child Protection kind of clients ourselves, which might mean more crisis type interventions, which is not really what we're meant to be doing*." (SP2)

Participants expressed that they valued hearing and seeing positive change and feedback from families, and supporting them to feel empowered, and missed these interactions with parents.

> *"When you get that positive feedback and you feel like you've done some good, that's the best*." (SP2)

Dialogue theme 4: Limited time and human resources mean limited capacity for learning new technology

Participants acknowledged the benefits of technology in improving the efficiency of administrative requirements, and improving ongoing engagement with families. They emphasised the importance of ensuring technological innovations were accessible for both families and service providers, due to both groups' limited capacity for taking on challenging tasks, especially during COVID-19 lockdowns. They also discussed how technology should not replace aspects of service that require comprehensive observation.

> *"- it needs to be user friendly for our clients. Because particularly if they are very vulnerable…too much information, not [being] clear…it can be really hard."* (SP1)

> *"If we can make things more flexible for families, there's more chance that they'll engage*." (SP2)

Key design considerations

Key insights gained from the dialogues included the need for fostering parent confidence and capacity to engage in parenting work, and using simple and familiar technology to reduce additional parental and service provider stress. Thus, key design considerations included opportunities to build parents' motivation and accessible technology.

Co-design workshop series 1: Discovering the design space and design problems

Participants

Workshops (*n*=3) were conducted with three service providers from Family Services, two of whom had participated in the dialogues and one of whom had participated in an adjacent co-design project occurring within the community health service.

Methods

Workshops were conducted between October-November 2021 using web-conferencing platforms due to COVID-19 restrictions. Each workshop lasted 1.5hours, including 2x 5-minute breaks. The first author first introduced the workshop's topic, then presented insights and reflections synthesised from each prior research activity. Participants were invited to respond to the researcher's synthesis and share perceived opportunities, considerations and risks regarding the workshop's topic. Simple visuals to anchor discussions were provided while participants freely associated in the discussion. For the workshop focusing on technology-assisted program components, participants were provided with access to an existing technology-assisted program and were encouraged to think-aloud while navigating the program.

Data handling, analysis and prioritisation

A researcher (the first or second author) recorded notes in situ during each workshop. All workshops were video and audio recorded, and video recordings were reviewed by the first author to closely observe participants' verbal and non-verbal responses and elaborate on notes taken in situ. Deductive content analysis was used to code data according to 'opportunities, considerations and risks, and inductively according to themes expressed by two or more service providers. Key themes were synthesised for sharing at the following workshop.

Results

Design problem 1: Simple technology with human support

Participants discussed how their transition to using more technology-based methods of engaging with clients and completing work was relatively new and sudden in the context of working remotely due to COVID-19. They emphasised a need for technology-assisted components to be simple to navigate with "*no guess work…it cannot be another thing I'm working on*." (SP3). A hybrid model of program delivery was also proposed by participants.

> *"I was envisaging was a program that parents might complete in their own time, but can discuss the content with their support worker who checks in with them on a given basis. The support worker can provide ongoing encouragement and support in between contacts as well."* (SP3)

Design problem 2: Parent engagement varies across the service journey.

Participants emphasised that no discrete points on parents' service journey would be more or less appropriate for a technology-assisted parenting program, because parents' engagement varies from client to client depending on factors such as their readiness and level of risk.

> *"It's more about understanding where a client's head is at in their journey, rather than a specific point."* (SP1)

They also discussed factors observed as being associated with parent readiness to engage in parenting work, such as expressing motivation or evidence of implementing changes in their parenting and insight into the role of parenting on children's behaviour. Building parents' self-efficacy through reflecting the parents' efforts was emphasised as important in helping parents recognise the progress they have made. Participants discussed the value their community health service places on empowering parents throughout their service journey to foster self-initiated change, as this can reduce overall service dependency which in turn can reduce waitlist burden.

> *We see many parents who want change but struggle with recognising or playing their role.*

> *Emphasising parents' role in the change process early on is important to seeing that change."* (SP2)

Key design considerations

Key design considerations identified through these workshops reinforced the needs identified in the dialogues for *accessible technology*, as well as a need for *ongoing availability* and delivery methods that are highly *adaptable* so that it can be deployed at any point on the *Family Services'* service journey to align with parent readiness for engaging with such a program. A hybrid model was proposed, in which service providers role may be to support parental *empowerment*. Subsequent co-design workshops therefore focused on defining processes of empowerment that PaRK could feasibly support.

Phase 2: Create a minimum viable product

Co-design workshops series 2: Defining empowerment

Participants

Participants in Series 2 workshops were the same participants from the dialogues (n = 2), as the additional service provider from Series 1 opted out due to a change in their role at the community health service.

Methods

All workshops lasted 1.5 hours, with 2x 5-minute breaks. The first workshop started with the first author presenting a synthesis of data from prior workshops, to provide rationale for the focus on empowerment. A definition of empowerment and related processes by Adams [40] was also introduced to frame activities: "*The capacity of individuals to take control of their circumstances, exercise power and achieve their own goals, and the processes by which they are able to help themselves (and others) to maximise the quality of their lives*." Processes were actionable approaches

to overcoming barriers to individual empowerment, and included: *raising awareness, gaining skills, building confidence, self-advocacy, networking,* and *taking action* [40]. Participants were invited to respond to: the researcher's data synthesis; centring the parenting program co-design to the concept of empowerment, and; proposed definition of empowerment. Participants were then invited to consider how these processes are currently practised and how they would ideally be practised, as well as ideas on how the ideal practice could be achieved based on their professional values.

Data handling, analysis and prioritisation

All workshops were video and audio recorded. The first author made live notes using an interactive board while service providers freely associated in the discussion. Video recordings were reviewed by the first author to more closely observe participants verbal and non-verbal responses and elaborate on notes taken in situ. Data were examined and additional notes were made by the first author to articulate apparent gaps and ideas to address these based on professional values.

Results

Participants agreed that empowerment was both a shared goal and a professional value that they would ideally like to strengthen in service provision.

> *"Empowerment is definitely a shared goal for us and parents…that message can get lost a bit…The message should be clear: you're going to be the one changing this, and we're going to be supporting you."* (SP2)

They discussed how building reflection and insight, patience and persistence, education, and peer support represented ideal practices to support parent empowerment. An example of the interactive boards depicting participants discussion points around current and ideal practices, and the first author's proposed gaps, is found in Figure 1.

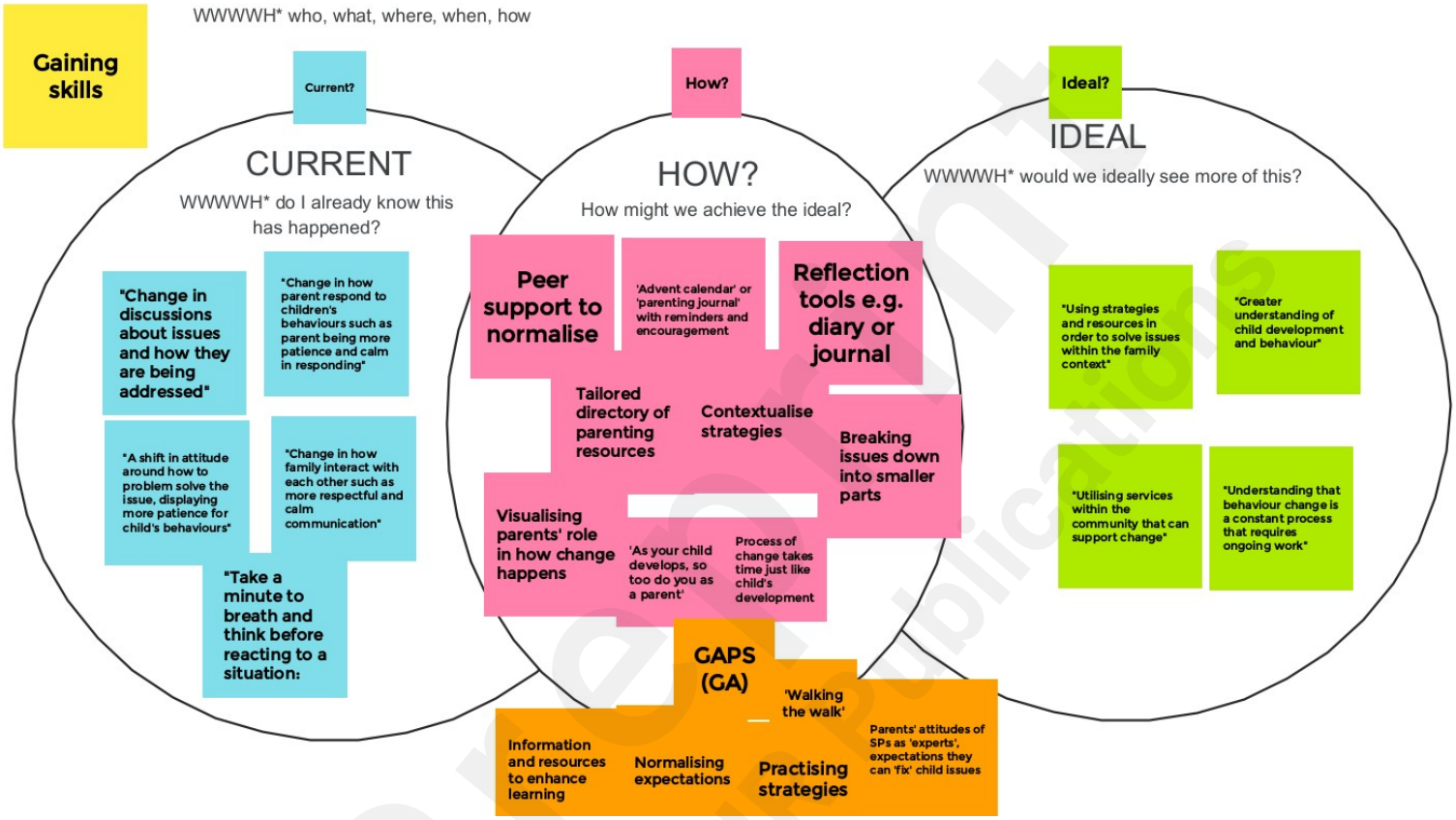


Figure 1.

Interactive board depicting service providers' discussion points around current and ideal practices, and the first author's proposed gaps

The broader research team (the second, third and fourth authors) then discussed and synthesised findings on the boards to reach consensus on perceived needs and potential design implications for enhancing processes of empowerment. These needs included:

- *Raising awareness:* an opportunity during service contacts for parents and service providers to establish a clear and shared understanding of each other's role in reaching care plan goals.
- *Gaining skills*: resources and activities beyond a service contact to learn about and practise meaningful skills/strategies, and normalise setbacks in service contacts.

- *Building confidence:* opportunities to notice and celebrate small-term changes *and* long-term ones.

Increasing opportunities for reflection emerged as both an underlying theme and priority gap that the PaRK co-design could feasibly address. The following quote from Adams [40] regarding the role of reflection as a process of empowerment was deeply considered:

> *"By its nature, empowerment is a critical activity. Self-empowerment and self-advocacy necessitate reflexivity by the individual. Reflexivity involves using the impact of a situation or experience on oneself to help understanding and feed into future activity."* [40].

Key design considerations

Embedding more opportunities and activities to *encourage reflection to support the process of parental empowerment* was identified as a final key design consideration. Service providers' role in leveraging opportunities was for reflection was deeply considered in producing program components that enable empowerment, because they are: a consistent engagement resource for parents to pause and reflect with; motivated to empower parents, and; trained in reflecting with others using collaborative approaches and building therapeutic alliances.

Final design implications and program components

The key design considerations were first consolidated into three design implications:

- *Deliver program content with technology that is accessible, adaptable and available on an ongoing basis*
- *Adopt a hybrid approach using service providers, to facilitate learning and reflection and enhance parental empowerment over program content*
- *Leverage existing skills and service elements to embed program delivery into service providers' existing practice*

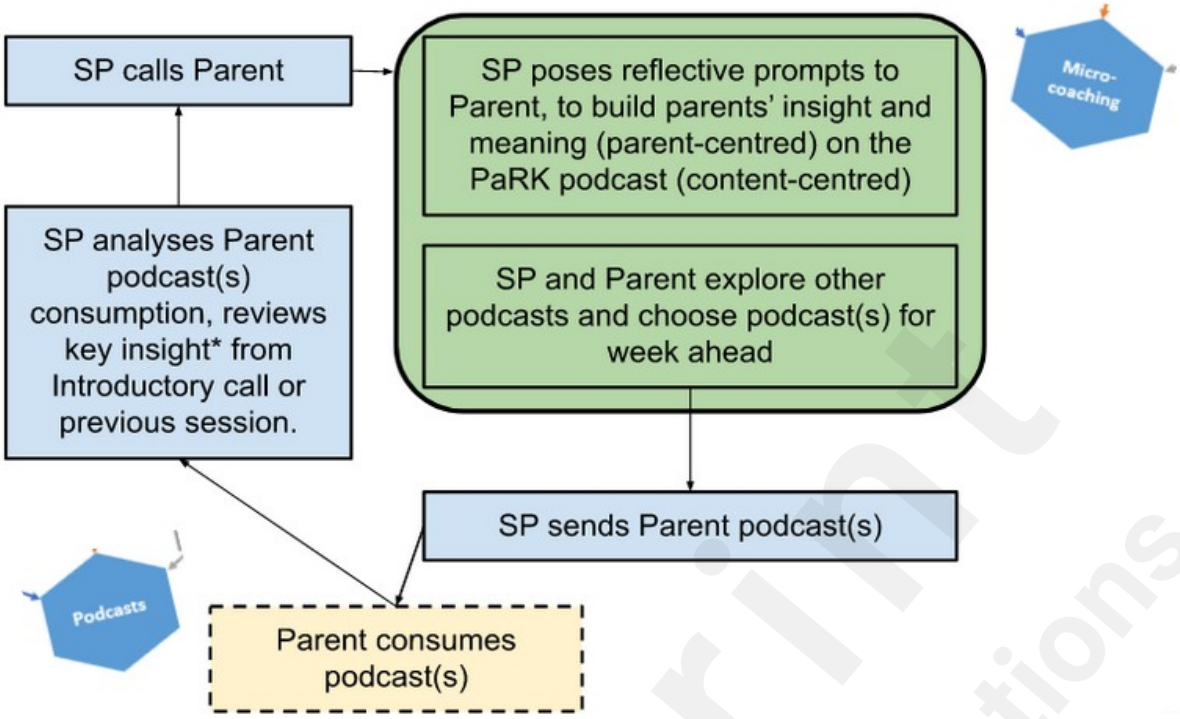
The following program components were developed to meet these needs:

- *Podcasts* were developed to deliver PaRK's evidence-based content. Podcasts are accessible as they require minimal media literacy; they are adaptable as content can be broken down into smaller 'bite-sized' chunks or modules, and sent depending on parents' readiness and preference, and they facilitate continuous learning and reflection with playback features and ongoing availability. Three out of a possible 12 topics from the original PaRK program were nominated by recruited service providers to be re-designed into trial podcasts, based on the parenting issues or concerns most-commonly encountered with parents in their service. They were: *Helping your child manage emotions; Establishing rules and consequences;* and *Managing conflict in the home.* The design and development of these podcasts comprised a separate research project. It was informed by media effects theory, coupled with an 'object-based media' approach [41,42].
- *Micro-coaching* was proposed to complement the process of acquiring knowledge from the podcasts, leverage the 'human element' of service providers to facilitate reflection, and meet the need for embedding more opportunities for reflection into existing service provision practices. Coaching can be defined as a learning process tailored to the coachee's needs through strengthening existing capacities for growth, characterised by collaboration, reflection and centring on goals [43]. Micro-coaching refers to using very short 'capsules' of coaching built into existing service contacts between parents and service providers, designed to meet goals that are specific and feasible to achieve in short timeframes. In this way, micro-coaching promotes parent reflexivity, gaining skills and confidence, all of which support the process of empowerment [40]. The design and development of the micro-coaching component is reported in the following section.

Figure 2 depicts the proposed delivery flow of PaRK-Lite's podcasts and micro-coaching.

Figure 2

Flow of the proposed program delivery for the community health service



(SP = Service Provider).

Co-design workshops series 3: Developing a prototype for micro-coaching

Participants

Participants were the same service providers who participated in the co-design workshops and the dialogues (n = 2).

Methods

The first author developed prototype components between workshops, based on insights and feedback generated during the prior workshop. The first workshop focused on exploring how service providers currently practise reflection with parents, so that these practices could be leveraged in micro-coaching components. Reflection was defined as: "*Looking for relationships between pieces of experience or knowledge, evidence of cycles of interpreting and questioning, consideration of different explanations/hypothesis and other points of view.*" [44]. The focus of each subsequent

workshop (n = 2) was two-fold: role-playing micro-coaching prototypes, and providing direct, experience-based feedback. Feedback discussions were semi-structured, guided by the '*four Ls*' (what was liked, what was lacking, what was learned and what was longed for').

Data handling, analysis and prioritisation

The first author recorded notes in situ during each workshop. All workshops were video and audio recorded, and video recordings were reviewed by the first author to more closely observe service providers' verbal and non-verbal responses and elaborate on notes taken in situ. Deductive content analysis was used to code data according to the '*Four L's*'. Data were examined and additional notes to articulate apparent gaps and ideas to address these were added by the first author and accounted for in the subsequent micro-coaching prototype.

Results: the micro-coaching prototype

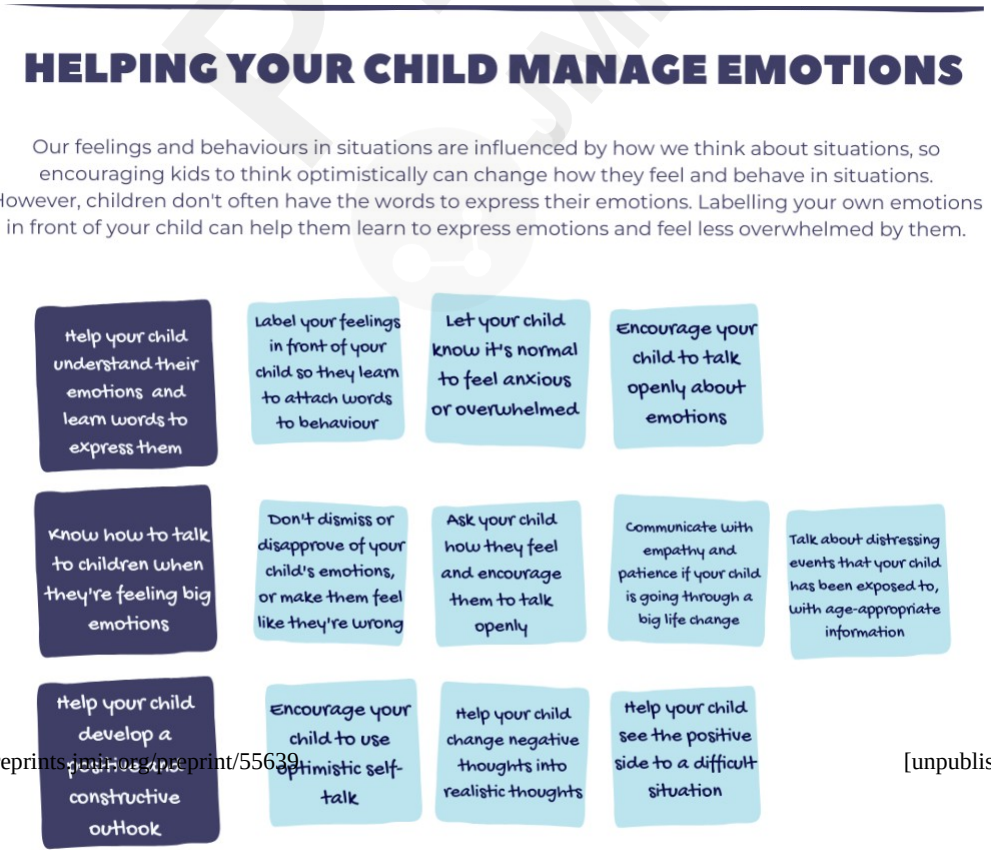
The micro-coaching 'minimum viable product' (MVP) consisted of: semi-structured micro-coaching session plans with note-taking templates attached (See Figure 3); and tangible artefacts to build shared understandings and support goal attainment, including a colourful and easy-to-read 'cheat sheet' presenting each podcast's evidence based strategies, and a goal-setting card for parents to refer to between micro-coaching sessions (See Figure 4 and Figure 5). Full details of the PaRK-Lite' micro-coaching components, including service touchpoints, functions/goals, and descriptions of each activity can be found in Supplementary File 2.

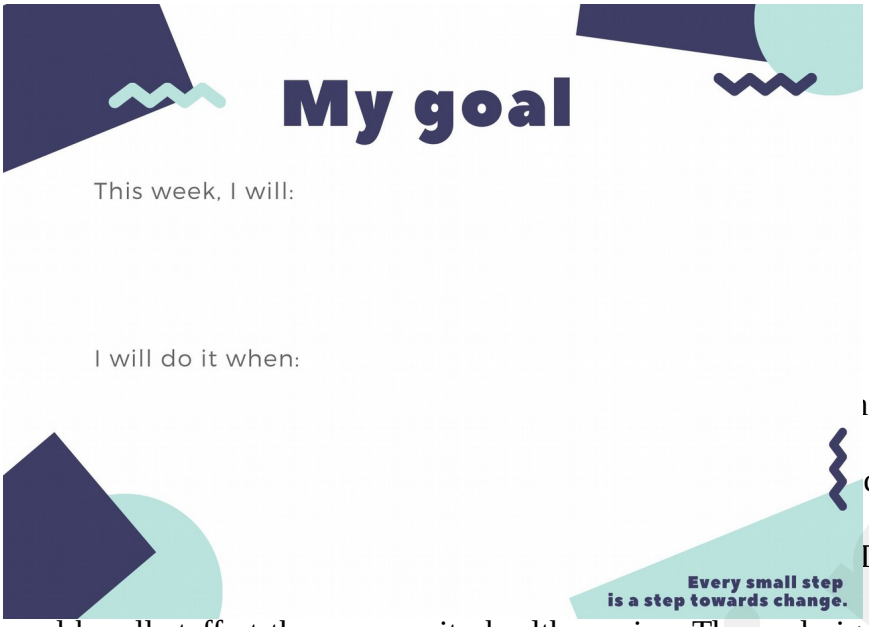
Figure 3

Sample of the micro-coaching session plan and note-taking template.

Aim	Prompts	Notes
Review	• What questions do you have after listening to the podcast this week?	
Knowledge	• What did the information in this week's podcast get you thinking about for you and your child?	
Reflection	• What was this like for you at home when you were young? How do you remember feeling at the time? • Difference between world we grew up in and world we raise kids in	
Strategy	• What kind of things do you already do at home?	
Goals	• Review last week's goal • Pick a strategy to try this week • Pick a time to try it (when is issue likely to come up?)	[Validate confidence, reiterate importance of practice, encourage!]

Figure 4
'Cheat sheets' for parents and service providers summarising the strategies presented in each podcast





ıgaging parents with PaRK-Lite was ctise the process in a step-by-step Teams channel, a platform currently used by all staff at the community health service. The re-designed PaRK was subsequently named '*PaRK-Lite*', capturing the adaptations' aim to deliver the PaRK program in a lighter-touch format.

Phase 3: Validate the prototype's design

Participants

Seven parents expressed interest in participating, of which six provided consent and completed the set-up session. Two parents requested to withdraw due to family emergencies and one parent could not be reached for follow-up. Three parents completed at least one micro-coaching session, so their data were included for analysis. Two of these parents completed the feedback interview, as one could not be reached for follow-up. Participant demographic information is presented in Table 2.

Table 2. Parent participant demographics (*n* = 3)

	n
Mean age (range)	34.6 (30-39)
Gender	
Male	1
Female	2
Born outside Australia	
Yes	1
No	2
Language other than English spoken at home	
Yes	1
No	2

Number of children	
3	2
4	1
Mean age of children (range)	7 (5-9)
Child(ren) with mental health diagnosis	
Yes	2
No	1
Service used at the community health service	
Counselling and Wellbeing	1
Family Services	1
Health Services	1
Medical Services	1
Other – not reported	1
Concession and/or Healthcare card holder*	
Yes	1
No	2
Educational level	
Secondary	1
Tertiary	2
Family structure	
Nuclear family	2
Single parent	1
Experience of life challenges	
Yes	1
No	2

*Provides recipients of government benefit schemes and low income earners with access to cheaper prescription medicines and health care services

Methods

The first author, who is a Provisional Psychologist with clinical experience working in family violence and public health settings, delivered the PaRK-Lite prototype (podcasts and micro-coaching) to recruited parents between June – August 2023, and conducted feedback interviews between July – August 2023. All micro-coaching sessions and feedback interviews were completed via telephone and were recorded using a dictaphone. Interviews followed a semi-structured format using an interview guide developed by the first and second authors designed to enquire about parents' experience of engaging with PaRK-Lite, and evaluate its key design considerations (see Supplementary File 3). It was reviewed by a peer researcher for content validity and to ensure the language was sufficiently simple and appropriate. Field notes were written during and after each

interview to support reflection and interpretation of the interview transcript. Credibility was achieved through peer checking and triangulation of field notes. Interviews were transcribed by a third-party transcription service, and checked by the first author for accuracy. Data collection and analysis occurred concurrently.

Data handling, analysis and prioritisation

The first author collected parents' podcast engagement data from a web-based podcasting platform (Transistor) between sessions using a purpose-built web application that provided de-identified information on episodes opened, completed, and playback functions used. Micro-coaching session recordings and feedback interview data were analysed using thematic analysis. The three design implications (see 'Final design implications and program components') informed start list categories under which parent feedback data were coded inductively by the first author, following the six-step process as described by Braun and Clarke: (1) familiarisation with the data, (2) coding, (3) generating initial themes, (4) renewing themes, (5) defining and renaming themes and (6) writing up [45]. NVivo data analysis software was used to code data. Codes were discussed between the first and second authors to ensure clarity of meaning. Following the coding process, initial themes for each design implication were constructed and discussed with the broader research team until agreement was reached.

Results

Engagement data. Set up call durations ranged from 9–18 mins (*M* = 14.6mins). *Micro-coaching* call durations ranged from 7–40mins (*M* = 22.37mins). Longer calls were due to one parent spontaneously providing feedback on the podcasts in addition to the micro-coaching. All parents (n = 3) expressed an interest in receiving all episodes from all three podcast topics (with all parents opting to start with *Helping your child manage* emotions) however two parents chose to receive one podcast topic (12 episodes) and one parent chose to receive all three topics (36 episodes). Adherence

to selected podcasts ranged from 41% to 80% (*M* = 65%). Podcasts replayed by parents ranged from 5% to 58% (*M* = 23%). Feedback interviews averaged 52.67 minutes.

Qualitative data. Micro-coaching sessions and feedback interview transcripts revealed themes pertaining to how PaRK-Lite's design met its intended purpose and parents' needs, as well as themes indicating emergent needs that the next iteration of PaRK-Lite could address to support parents' engagement. A novel theme relating to engaging children with the podcasts also emerged.

Technology (podcasts).

Accessibility. Participants described how flexible delivery features (such as tailored delivery of reminders and the podcast's playback features), relatable podcast scenarios, and relevant topics helped the content and delivery of PaRK-Lite feel accessible.

"*The way you've structured your modules and the way you guys are delivering them, they're very engaging as opposed to what they [another existing web-based parenting program] have got*." (P21)

Adaptability. The collaborative focus of micro-coaching sessions and flexibility around session scheduling, having podcast chunks sent at specific times in the day depending on changing schedules, and the ability to progress at their preferred pace helped participants feel that PaRK-Lite was highly adaptable and tailored to their needs, readiness and personal circumstances.

"*The flexibility and understanding around it, I guess. That was really, really good*." (P18)

Continuity (ongoing). Parents expressed an intention to listen to the podcasts in the future to either refresh their memory of strategies previously discussed or practised, or to facilitate self-guided learning as their family's situations and needs change or emerge.

"*It's definitely something that I'd probably go back to in case – when I just need a little reminder of if I'm doing okay*." (P18)

Emerging needs expressed by participants that future iterations can address included: tips to centralise chunks and reminders sent by the coach so that they are all in the one place to help parents track their progress, and reducing the amount of slang and broadening the podcast's genre to appeal to parents from culturally diverse backgrounds to enhance accessibility, and; further resources for

navigating conversations with age-appropriate information, and for other parenting support designed for parents of children with diagnosed mental health or behavioural problems to support ongoing learning.

Empowerment through reflection (micro-coaching)

Participants reported that the use of everyday scenarios and dialogues between parents and children to illustrate parenting strategies was highly effective for prompting reflection and insight into the different perspectives between themselves and their children.

"I never realized how it sort of feels for the kids. So that that podcast did feel like that day: 'Oh, they might must have been going through some big emotions when we were doing that.' So that was sort of a provoking one." (P21)

The use of probing questions and paraphrasing by the coach during micro-coaching was reported as helpful in both contextualising podcast content, and appreciating the value of their own observations and experience. Common insights included: greater awareness of what may be triggering their child's behaviour, broadened understanding of their own or their child's perspective, strategies that are most relevant to the changes they are trying to enact, and opportunities in which trying out these strategies might be most effective.

"*They have been great. I think they just set the right perspective to things as well… helped me understand…and sort of made me think.*" (P21)

Participants reported goal setting supported them to enact strategies, and reflect on the outcome with the coach. Both participants opted to enact the strategy of being curious rather than dismissive and asking their child how they feel if they are expressing big emotions. One parent reported their child had since become more "relaxed" in talking about their emotions, while the other reported their child was initially surprised and took some time to open up. Both participants reported feeling accomplished as a result, which increased their sense of self-efficacy about implementing strategies in future; although mild hesitance was expressed about how situational factors might influence how effectively they can implement strategies.

"*I'm feeling pretty confident about that change now, especially after last night's ordeal. When I*

confronted that in a calmer way than what I expected I would." (P18)

Emerging needs expressed by participants that future iterations can address included: resources for writing down reflections and insights to support knowledge acquisition; further resources for contextualising podcast content to their family's needs; and practising strategies through modelling (i.e. through watching videos) or role-playing during micro-coaching.

Embedding into existing services

Participants reported several factors that would enhance their engagement with PaRK-Lite if embedded within the community health service. Firstly, participants reported that PaRK-Lite should be presented as an option rather than recommended, as being recommended to engage with programs could result in feeling pressured to engage, and the subsequent stress would likely reduce their engagement and further negatively impact their parenting.

"*If this were something that I was expected to do…it could impact my parenting in quite a negative way… because it would stress me out more*." (P18)

Secondly, they reported that service providers' expectations of parents' engagement with PaRK-Lite should be flexible and collaboratively structured, as this was a highly valued aspect of their experience and contributed to them feeling less pressure and more empowered.

"*It's flexible, it's within your own time, there's no real expectation…I think that would make me feel more inclined to keep going*." (P18)

Emergent theme: Involving children.

Both parents discussed how they either did, or intended to, listen to the podcasts with their children to facilitate their children's learning about the podcasts' topics, and to serve as an exercise to build mutual understanding and connection.

"*Having kids sit through these podcasts helps also that they understand what the concept and the reasoning behind them is*." (P21)

DISCUSSION

This co-design study aimed to innovate a community health service with technology-assisted

parenting support for families of children who experience adversity. Our method involved first co-designing adaptations to an existing evidence-based parenting program's delivery format with service providers to ensure the innovative program fits with and enhances existing practices, then piloting the adapted program with target end-users to simultaneously offer additional support while obtaining experience-based feedback to check that it meets parents' needs and/or if further adaptations are needed. Our key findings and design implications included firstly that that when it comes to services who work with families of children experiencing adversity, technology-based innovations that are accessible, adaptable and offer ongoing availability are needed by both service providers and parents to promote engagement with delivering or receiving the program, respectively. Secondly, strengthening processes of parental empowerment was deemed crucial by both service providers and parents for enhancing engagement with parenting support, and for promoting changes in parenting. Lastly, embedding innovations (namely novel technology and opportunities for reflection) as seamlessly as possible into existing service provision practices was emphasised as valuable by service providers to reduce additional workload burden, and appealing to parents so long as engagement is optional and flexible. These findings will be elaborated and discussed in the following sections with reference to past research.

1. Designing for technology-assisted service provision

The first design implication focuses on the technological needs and literacy in this context. Findings from Phase 1 indicated that accessibility, adaptability and continuity are critical factors when integrating technology into the Family Services context, because the need to learn or set up technology was likely to lead to disengagement given the high-needs and low-resource context. Service providers also expressed that the human element and connection should not be replaced. These findings echo the broader literature in that acceptance of technology will likely be enhanced if technology does not significantly interfere with building engagement and rapport and is easy to use

or requires low technological literacy [24,46,47]. We therefore suggest that including practitioner attitudes and skills in using technology is a key factor to consider for designing and implementing technology-assisted support in health services.

Accessibility

Accessibility was strongly emphasised by service providers to ensure that the technology-assisted innovation is appealing and usable for those delivering and receiving programs. Using simple accessible technology and familiar platforms also enabled parents to self-manage their engagement, which was on average very good. Previous research has identified that programs with complex language can lead parents with differing literacy levels or linguistic diversity to doubt their ability to complete a program [20], and further that audio or video formats are preferred by program users [48]. The use of sports commentary as a genre, humour and everyday scenarios to illustrate parenting strategies in the podcasts enhanced parents' self-reported relatability to the information presented and subsequent engagement with the content. However, reducing instances of slang and broadening the genre and narrative style to appeal to a broader range of parents from different cultural backgrounds is suggested for both future adaptations of the podcast and future research.

Brief program duration

Families of children experiencing adversity often face multiple responsibilities to manage socio-economic disadvantage [49], which was echoed by service providers in Phase 1 of this study. Prior research has indicated parents experiencing socio-economic disadvantage prefer briefer program durations so they can accommodate their engagement between their day-to-day responsibilities [20]. As described in the '*Prototype development*' section, we developed podcasts that delivered short and focused content in small, 'bite-sized' chunks to meet this need. Breaking down complex topics into smaller, digestible units can help parents absorb information more effectively, and a consistent module-based structure can facilitate parents' engagement with the content in small increments if

needed. This structure also enables parents to choose modules that they feel will address their immediate concerns or interests and reduce feeling overwhelmed by information, which has been reported as a barrier to engagement by service providers in this study and by parents in prior research [50]. Parents in this study reported that the ability to consume chunks of evidence-based information at preferred times was both highly valued and effective in supporting them to engage, reflected in the overall high completion rates.

Adaptability

Service providers also emphasised a need for adaptable technology that they can tailor to meet the specific needs of parents at any point in their service journey. To achieve this, we designed the podcasts to exist in small, bite-sized chunks, allowing parents to choose the amount of content and pace of engagement. Parent preferences for amount and pace varied, yet the good adherence rates suggest that this facilitated their engagement. The micro-coaching built in adaptability by allowing service providers to draw on their existing competencies with providing parenting support rather than requiring them to follow manualised instructions, and allowing parents to establish the session focus depending on their needs and circumstances- which was reported by parents as a highly valued aspect of their experience. These findings are consistent with prior research, which has shown that building in adaptability can influence acceptance of technology, as it facilitates the innovation deliverer's perceived competence with delivery [25], and indeed facilitates their implementation of the innovation [21].

Continuity (ongoing)

Ongoing access to support is vital for maintaining engagement and fostering long-term change [51], especially in contexts where behavioural change can be a long-term process due to the many stressors and challenges faced by the parents accessing Family Services. Designing for continuity involves ensuring that the technology-based services are available and accessible over an extended

period [52]. Parents reported that features of PaRK-Lite designed for continuity were useful, as revisiting the podcasts and written artefacts facilitated self-guided learning and contributed to their sense of self-efficacy about navigating their parenting in the future.

2. Empowering parents through a tailored, hybrid approach

Findings from Phase 1 revealed that service providers' experience with parents suggested that parental engagement with their service is linked to their readiness for change, and that empowering parents to build readiness for change is highly valued, yet a key challenge given the prevalence of complex circumstances and competing needs families typically present with. This finding is consistent with prior research, which has demonstrated that parents' everyday stressors and concerns about parenting are negatively associated with parental empowerment [53], which in turn has been positively associated with parental engagement [54]. To address this, we explored how PaRK's re-design could facilitate opportunities for parents to learn and reflect on their parenting, as self-empowerment necessitates reflexivity [40].

Learning from evidence-based information and strategies

Parental empowerment has been conceptualised as "*a process through which families can access knowledge, skills and resources that enable them to gain positive control over their lives*" [55]. Service providers expressed that integrating evidence-based tools to outsource some parenting work would be beneficial in the long-term for reducing service dependency and waitlist burden. The use of entertaining audio-based resources and concrete artefacts (such as visual aids) was intended to help outsource some parenting work, while promoting active engagement and maintaining interest. Parents reported that the humour and relatability of the everyday scenarios and dialogues between parents and children in the podcasts was critical in their process of learning and prompting reflexivity. In fact, parents expressed an emerging need for access to additional and further resources

to continue their learning. Future iterations of PaRK-Lite can therefore involve components to facilitate parents' further learning.

Hybrid approach

Findings from the co-design workshops in Phase 1 highlighted that service providers value the 'human element' in their work with families along with the need for simple and familiar technology. Thus, a hybrid approach to program delivery was most appropriate, with the 'human element' creating opportunities for reflecting on parenting between parents and service providers. Hybrid approaches to program delivery have emerged as a promising model in various educational and professional settings [56], as they offer the significant advancements in educational technology while embracing the enduring value of human interaction. For instance, adaptive algorithms and analytics can enable tailored delivery of content while the presence of coaches or service providers fosters a supportive and collaborative environment that promotes active discussion, questioning and feedback to enhance critical thinking, engagement and a sense of belonging [57]. Prior research has also shown that human support can enhance adherence to digital interventions [58,59]. In this study, parents reported that their contact with a coach, who supported them to appreciate the value of their insight and feel empowered by their knowledge and experience, contributed to changes in their parenting and increased self-efficacy around implementing parenting strategies in future. This finding is consistent with prior literature that has demonstrated how exploring and addressing parents' concerns is important in building parents' motivation to engage with parenting programs [60]. The hybrid approach, with its synergistic combination of technology and human connection, offers a rich and comprehensive learning experience that maximises the benefits of both elements.

3. Embedding innovations into existing practices

The third design implication focused on embedding the co-designed innovation into existing

practices, by understanding and utilising existing service elements and practices as a design constraint. Findings from Phase 1 indicated that service providers' experiences of successful person-centred practice was the most rewarding aspect of their role, but such experiences are relatively infrequent given change is inevitably a long-term process. Time constraints also meant that service providers valued innovations that were feasible to integrate into existing practices. These findings are consistent with prior research, which has suggested that innovation adoption is more likely when the innovation is perceived as meaningful and valuable, and involves fewer changes to existing practices [23,61]. To address this, we considered existing service elements and practices as 'soft peripheries' to be adapted and leveraged, in order to facilitate adoption, implementation and scalability of the evidence-based intervention, i.e. the 'hard cores'.

Leveraging existing skills: coaching

Strengthening parental empowerment involves practitioners shifting from authoritative approaches to facilitative approaches of engaging with parents, sharing power and encouraging independence [40]. Findings from Phase 1 suggested that service providers strongly value facilitative approaches, consistent with a 'coach' approach to engaging with parents. Specific skills utilised by coaches include active listening, communication skills and building motivation [43]. The micro-coaching component of PaRK-Lite's hybrid design thus intended to leverage service providers' existing coaching skills to ensure fewer changes to their existing practice and enable parent empowerment through increased opportunities for reflection. *Micro-coaching* was well received by service providers, and their engagement in the iterative development process (evidenced by the number of changes made in each iteration) supported the perceived value of this resource. Service providers also valued the flexible approach to micro-coaching delivery, consistent with past research emphasising flexibility as a crucial aspect of successful implementation of parenting programs [21]. Parents in this study echoed the need for flexibility and collaborative approaches to support their

initial and ongoing engagement in PaRK-Lite with a service provider. Overall, these findings are consistent with the "*Supportive Accountability*" model, which predicts intervention engagement can be enhanced when eHealth interventions include a coach who is perceived as: trustworthy and benevolent, willing to involve people in defining goals and expectations, minimises negative consequences of perfunctory adherence, and frames performance monitoring as devoid of negative consequences [62]. Prior research has demonstrated that service users appreciate practitioners' willingness to engage in conversations that foster empathy [63], and that embedding relational strategies such as micro-coaching into existing points of contact is especially important for enhancing underserved communities' trust and engagement with services [64]. Overall, micro-coaching exemplifies how existing staff resources can be leveraged to promote the use of evidence-based parenting support by those both delivering or receiving such support.

Leveraging existing service elements

PaRK-Lite's hybrid design involves light-touch requirements from service providers, to ensure that it could be embedded into both the '*Active Holding Response*' and '*Medium-Term Casework*' service elements of Family Services. For example, the brief program duration of PaRK-Lite complements the short-term nature of interventions offered during the '*Active Holding Response*', and can help reduce frustration associated with being on waitlists [65] by enabling short-term change that builds parents' confidence in enacting longer-term change once engaged in '*Medium-Term Casework*' (if still needed). Embedding self-directed learning and opportunities for reflection supports the underlying goal of '*Medium-Term Casework*' to empower parents. Parents expressed a need for PaRK-Lite to be presented as universal option rather than a targeted recommendation, and for service providers to flexibly and collaboratively structure their engagement. The Family Services' '*Care Plan*' service element involves families and service providers collaboratively setting goals regarding desired outcomes and intervention pathways, hence the next iteration of PaRK-Lite can integrate

these needs into the Family Services' '*Care Plan*' service element.

Limitations and directions for future research

Some methodological limitations in this study warrant discussion. Firstly, our co-design methodology involved understanding contextual needs and the design space for adaptations through service providers only, as COVID-19 significantly impacted our ability to reach parents who were experiencing additional stress due to lockdowns. Similar recruitment difficulties have been documented elsewhere [27]. While our method is consistent with recommendations from prior research [20], and may represent an efficient method for reducing time asked of participants while upholding principles of co-design, it did not permit an authentic exploration and integration of parents' needs from the outset. Such views may have shaped the initial design of PaRK-Lite's prototype, particularly with regard to the podcast's genre and narration style. Secondly, the total number of participants in both Phases 1 and 2 was small. We ensured that recruited service providers were representative of touchpoints with parents on the Family Services journey, and recruited parents came from very different cultural backgrounds regarding gender, religion and family structure. While our findings are also overall thematically consistent with prior research, and while small sample size is considered appropriate for a small-scale, in-depth, case-oriented approach to analysis [38,39], integrating a wider range of service provider and parent views may have shaped PaRK-Lite's initial design. Thirdly, PaRK-Lite was delivered to parents by the first author, who also contributed to PaRK-Lite's co-design and conducted parent feedback interviews, rather than a service provider. This may have influenced how parents' experience and feedback of PaRK-Lite was interpreted and presented, and introduced potential gaps or biases in understanding the feasibility for service providers to deliver PaRK-Lite in its current format. Having service providers deliver PaRK-Lite at a small scale is thus a priority for the next phase of its iterative development process. The Double Diamond framework for design emphasises iterative development and is not intended to be adhered

to in a discrete or linear manner [36]. This study represents the first design iteration, and we intend to integrate these limitations along with parents' feedback on PaRK-Lite's initial design into its next iteration. We also intend to evaluate potential organisational barriers and facilitators to implementing PaRK-Lite, and developing strategies to support its implementation based on this. We believe this level of formative research is necessary to reduce foreseeable logistic complexities and facilitate its adoption, as this in turn may facilitate conducting a larger scale, real-world evaluation of PaRK-Lite.

Findings from this study provide strong support for a hybrid approach to delivering technology-assisted parenting program components. This approach supports parents' self-directed learning while leveraging the presence of an experienced service provider who can provide tailored support through reflecting with the parent on their learning journey. We suggest future research continue to explore and refine how micro-coaching can complement technology-assisted methods of delivering evidence-based parenting support to enhance engagement between parents of children experiencing adversity, and services that support these parents. A novel finding that emerged from this study was related to parents spontaneously involving their children in their engagement with the podcasts. This finding highlights the design's accessibility and adaptability, and appeared to empower parents to creatively engage with the content to facilitate reflection and understanding between themselves and their children. This finding is also consistent with prior research, which has found that fathers prefer web-based parenting programs that also involve their adolescent child [66]. Future research may thus consider involving both parents and children as co-designers to explore how parenting programs can be used to simultaneously facilitate both parent and child learning and foster connection and understanding between parents and children.

CONCLUSION

In conclusion, findings from this study support the key role that service providers play in early phases of innovation, as they possess both specialised knowledge about the contextual structures that

may be innovated, as well as sufficient insight into the lived experience of parent clients to design an appropriate prototype that overall met parents' needs. Our findings suggest that empowering parents by embedding reflective practice and accessible and adaptable technology was key to designing an appropriate technology-assisted parenting intervention for parents of children experiencing adversity. Researchers, practitioners and designers in the field of human-computer interaction and health service design can consider our methods and findings in creating engaging interventions that have a positive impact on the well-being of children and families.

CRediT authorship contribution statement

Grace Aldridge: Investigation, formal analysis, data curation, project administration, visualisation, writing – original draft and preparation. **Jennifer Robinson**: Validation, Visualisation, Writing – review and editing. **Ling Wu:** Conceptualisation, methodology, investigation, formal analysis, writing – original draft. **Joshua Seguin:** Methodology, formal analysis. **Patrick Olivier:** Conceptualisation, supervision, methodology, writing – review and editing. **Marie Bee Hui Yap:** Conceptualisation, supervision, writing – review and editing.

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Supplementary Files

Multimedia Appendixes

Co-design methods and aims.
URL: http://asset.jmir.pub/assets/e4e0c00a52589441ae18ba898eee7420.docx

Details of micro-coaching components.
URL: http://asset.jmir.pub/assets/a90d0b5413b95ce4fbd9f7a504e8613d.docx

Parent interview schedule.
URL: http://asset.jmir.pub/assets/4ea6aa44e73e51d6b92e108c750ddefb.docx