Using Technology in Social Work Practice:
The mDad (Mobile Device Assisted Dad) Case Study

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Abstract: *Mobile technology presents an exciting opportunity for social workers to reach populations that are typically underserved by interventions and services. We present one application of technology that is particularly relevant to social work practice. The mDad (Mobile Device Assisted Dad) smartphone application (app) was developed to augment existing social work practices by providing a father-friendly tool to help new fathers learn about and engage with their infants and toddlers. We discuss the process of developing the smartphone app content and conducting usability testing of the mDad app. We conclude with a discussion of the lessons learned from the mDad project and the challenges of implementation and dissemination of technology-based interventions in community contexts.*

Keywords: *Father, fathering, parenting, intervention, prevention, child welfare*

Mobile phones are ubiquitous: 91% of Americans own a mobile phone (Pew Research Center, 2014), and 61% of mobile phone owners have a smartphone (Nielsen, 2013). Smartphones are extremely versatile and are an increasingly important part of people's daily lives. One study showed that smartphone users had their device with them or in the same room 90% of the time (Dey et al., 2011). Moreover, mobile phones, smartphones, and tablets are starting to bridge the "digital divide" of economic and social inequality in access to technology-based information (Chang et al., 2013; Ginossar & Nelson, 2010). Smartphone ownership rates are actually higher among African Americans (33%) and Hispanics (45%) than Whites (27%) (Nielsen, 2011). Young people have especially high rates of mobile technology use; for example, 77% of 18-29 year olds with an annual household income of less than $30,000 are smartphone owners, and rates of smartphone ownership in this age range are between 80-90% among those with higher incomes (Pew Research Center, Internet and American Life Project, 2013).

In response to the growing use of online and mobile technology, there has been unprecedented growth in efforts to use technology as a tool to improve health outcomes. Although much of this research is in its early stages, technology-based interventions using the Internet, smartphones, and text messaging are increasingly being applied to promote psychosocial wellbeing as well as physical health. For example, currently available interventions aim to alleviate depression and mental illnesses (Burns et al., 2011; Depp et al., 2010; Granholm, Ben-Zeev, Link, Bradshaw, & Holden, 2012), promote happiness and emotional self-awareness (Della Porta, Pierce, Zilca, & Lyubomirsky, 2012; Morris et al., 2010), increase relationship satisfaction (Kalinka, Fincham, & Hirsch, 2012), increase prosocial behavior and reduce aggressive behavior (Rajabi, Ghasemzadeh, Ashrafpouri, &

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Saadat, 2012), and promote parenting skills and reduce child maltreatment (Baggett et al., 2010; Evans, Wallace, & Snider, 2012; Jordan, Ray, Johnson, & Evans, 2011; Mast et al., 2014; Ondersma, Svikis, Thacker, Beatty, & Lackhart, 2014; Thraen, Frasier, Cochella, Yaffe, & Goede, 2008; Walters et al., 2014; Whittaker et al., 2012). Furthermore, findings from pilot studies suggest that mobile technology can be an effective tool to deliver behavioral health interventions to at-risk populations (e.g., Aguilera & Munoz, 2011; Carta, Lefever, Bigelow, Borkowski, & Warren, 2013; Gazmararian, Elon, Yang, Graham, & Parker, 2013). Thus, the use of mobile technology may present an opportunity for social workers to reach typically underserved or hard-to-reach populations.

In this paper, we discuss one application of technology with particular relevance to social work practice. The mDad (Mobile Device Assisted Dad) app was conceived of as an innovative way to augment existing social work practices by providing an accessible, father-friendly tool to help new fathers learn about and engage with their infants and toddlers. The mDad app incorporates educational content on child development with suggestions of simple activities that fathers can engage in with their infants and toddlers. In this paper, we describe the initial development and usability testing of the mDad app and implications for social work practice with fathers and families.

Usability testing is a practice that analyzes early implementation processes and evaluation procedures before they are finalized (Akin et al., 2013). Because the field of technology-based interventions is growing at breathtaking speed, explicating our experience with the content development and usability testing processes of developing the mDad app will help researchers and practitioners interested in the application of technology to social work. In our case, the process of usability testing included extensive examination of the acceptability of mDad content to the target population, as well as examining users' interactions with the app interface. This process of extensive usability testing was particularly important because social workers and other service providers have had little success engaging fathers in traditional parenting education approaches. Therefore, we used qualitative interviews and focus groups to better understand how men reacted to and engaged with the content of mDad, with the long-term goal of learning how to more effectively tailor mobile interventions for new fathers to their unique parenting needs.

Why Focus on Fathers?

In focus groups and discussions with diverse fathers including young fathers, military fathers, and low-income African American fathers, men have voiced a genuine desire to be involved with their children and to be positive parents and partners (Lee et al., 2013; Lee, Yelick, Brisebois, & Banks, 2011; Walsh, Dayton, et al., 2014). However, fathers have also articulated challenges in understanding how best to engage with their children, especially infants. Concerns about being a positive, engaged parent were particularly salient among two groups: (a) military fathers, who experienced long separations from their children because of deployment, and (b) urban African American fathers, who voiced the desire to "step up" in ways that their own fathers had not. Motivated by the desire to be a good parent and the experience of significant parenting challenges, many fathers are interested in receiving support for building their parenting skills (Walsh, Dayton, et al., 2014).

Despite the interest of most fathers in being a good parent, practitioners and researchers usually face difficulties when trying to engage fathers in interventions to promote positive father-child relationships (McAllister, Wilson, & Burton, 2004; Stahlschmidt, Threlfall, Seay, Lewis, & Kohl, 2013). Generally, parenting education and intervention programs have been designed for and evaluated using mothers (Bilukha et al., 2005; Lundahl, Tollefson, Risser, & Lovejoy, 2008; Mikton & Butchart, 2009), with notable exceptions (e.g., Cornille, Barlow, & Cleveland, 2005; Fagan, 2008). Thus, the content of most parenting programs might have little direct relevance to the experiences of most fathers. For example, few programs account for the needs or experiences of nonresidential fathers. Moreover, some providers have conflicting feelings about fathers' participation in parenting programs and services. Because few practitioners are trained in methods for engaging fathers, service environments often lack a "father-friendly" atmosphere (O'Donnell, Johnson, D'Aunno, & Thornton, 2005). In addition, evidence has indicated fathers have low levels of interest in traditional parenting programs (Cornille et al., 2005; Duggan et al., 2004; Fagan & Iglesias, 1999; O'Donnell et al., 2005; Raikes, Summers, & Roggman, 2005). One study of Early Head Start-sponsored efforts to engage fathers indicated 17% of fathers participated in at least one parenting education program; however, fewer than 10% of fathers participated in father-only events (Raikes et al., 2005). Moreover, when parenting services are available only during traditional weekday business hours, fathers' work schedules often prevent their participation. An additional participation barrier stems from the stigma associated with asking for assistance, but scant data are available on stigma specific to parenting programs.

Technology-Based Approaches Designed for Mothers

Although the use of technology to deliver parenting education and interventions to fathers is an emerging practice, using technology to engage mothers is a fairly well-established approach, including computer-based (Ondersma, Grekin, & Svikis, 2011; Ondersma, Svikis, & Schuster, 2007), web-based (Feil et al., 2008; Thraen et al., 2008), and mobile phone-based approaches (Bigelow, Carta, & Lefever, 2008; Carta et al., 2013; Jabaley, Lutzker, Whitaker, & Self-Brown, 2011). One study used text messages as an enhancement to home visitation services and found lower rates of attrition among the mothers who regularly received text messages from service providers. In addition, as compared with mothers who did not receive text messages, mothers who received text-enhanced services reported lower levels of depressive symptoms (Carta et al., 2013). The Text4Baby program has been widely used to promote maternal and child health during pregnancy and infancy. Results from Text4Baby are promising, and initial program evaluation has shown users felt more prepared to be new mothers and were more opposed to alcohol use during pregnancy (Evans et al., 2012). Other notable findings showed over 600,000 pregnant women and new mothers have enrolled in Text4Baby, demonstrating tremendous reach and dissemination of a text messaging-based intervention (Gates, Stephens, & Artiga, 2014). More important, many of the mothers reached by Text4Baby would have received little, if any, parenting education via traditional means. However, to our knowledge, to date no technology-delivered parenting approach has focused on fathers.

mDad Rationale and Preliminary Studies

Multiple factors motivated the development of mDad. First, there are relatively few existing parenting interventions designed for and tested with fathers, including non-residential fathers. Second, stigma associated with asking for help and education may prevent fathers from accessing existing services. Third, prior research suggests that technology-based parenting interventions with mothers are effective, yet few or no technology-based approaches have been designed for and tested with fathers. Given that fathers are unlikely to participate in traditional parenting education services, technology-based approaches hold promise for extending service provision to an underserved population. Fourth, we believe that technology-based approaches have great potential for reaching specific at-risk groups of fathers, such as young fathers, who might be disconnected from services but well connected to technology. Fifth, our approach was informed by evidence that pregnancy and the birth of a new child present a moment of high parental motivation when fathers are likely to be more receptive to parenting information and services. Therefore, the perinatal period presents a window of opportunity to engage fathers in intervention to promote the development of positive father-child relationships (Dubowitz, 2002; McLanahan, Garfinkel, Mincy, & Donahue, 2010; Walsh, Tolman, et al., 2014). Our survey of the research illuminated the many real and perceived barriers that fathers face in engaging with services, including lack of availability of parenting education specific to fathers and lack of father-friendly content. Foremost in our minds was the need to make mDad content father-friendly.

Our preliminary studies underscored the importance of these issues. Prior to development of the mDad smartphone app, the authors conducted focus groups and interviews with fathers representing a range of parenting contexts, including low-income fathers and military fathers (reported elsewhere: Lee, Neuget, et al., 2013; Lee, Yelick, et al., 2011), selected in part because they represent fathers who may lack needed supports and experience significant parenting stressors, including complex family structures, socioeconomic disadvantage, and periods of separation from their child (e.g., due to extended military deployment). These discussions were a part of the principal investigator's ongoing research agenda and took the form of more general conversations about fatherhood, parenting, barriers to father engagement, and fathers' perception of whether technology would be a suitable tool to meet their parenting support needs. In other words, these focus groups and interviews were not about the mDad app per se, but served as preliminary studies to inform its development. A key take-home point from both studies was that fathers felt unsure how best to engage with young children, particularly during infancy when child care is often thought of as primarily the role of mothers. Results further suggested that fathers tend to rely more on informal sources of parenting information (e.g., spouse/partner, family members, friends) than on formal sources of information (e.g., pediatricians and social workers). The fathers who participated in focus groups were interested in a range of parenting information related to children's growth and developmental milestones, as well as effective co-parenting and communication. Furthermore, most of the participants in these groups reported high levels of technology use and seemed amenable to the possibility of using technology such as a smartphone app to learn about caring for their baby. Sample demographics and characteristics and more

detailed analysis of the results are reported elsewhere (Lee, Neuget, et al., 2013; Lee, Yelick, et al., 2011).

mDad Content Development

We assembled a multidisciplinary research team to develop the "beta" version of mDad. The team included social workers and psychologists with expertise in father engagement, early child development, and parent support programs, as well as a technology-development team who specialize in developing and delivering Internet-based and mobile health interventions. The social workers and psychologists reviewed the early child development and father engagement literature and developed the father-friendly parenting education and support that constitutes the content of the app. The technology specialists were responsible for development of the application software, tailoring technology, and creative design.

The mDad beta app was designed to send push notifications to users' smartphones two times per week. The push notifications link to parenting education messages within the app containing information on the development of infants and toddlers and developmental milestones. This information is presented in conjunction with suggested activities to help fathers think of new ways to engage with their baby. In addition, the parenting education prompts users to use the app to document their child's development by creating logs and uploading pictures and videos. The mDad app is designed so that fathers can use it with their partner (such as the child's mother or caregiver, or another significant person) or independently.

Our preliminary research helped to guide the development of mDad content (e.g., Lee, Neuget, et al., 2013; Lee, Yelick, et al., 2011; Walsh, Dayton, et al., 2014). For example, we used a multi-pronged approach to enhance the father-friendly nature and the relevance of mDad content (see Figure 1). In contrast to programs such as Text4Baby that primarily focus on messages related to maternal and child health, mDad was designed with an explicit focus on opportunities for paternal engagement; that is, mDad focused on presenting simple, concrete ways for fathers to interact with their baby through providing care, playing games, or reading and talking to the baby. This focus was informed by our preliminary studies in which fathers described challenges and uncertainty related to engaging with their infant.

Research has shown that when users received messages tailored to their individual needs and characteristics, the messages were perceived as more relevant, were more likely to be read and recalled, and were more effective at changing behavior (Hawkins, Kreuter, Resnicow, Fishbein, & Dijkstra, 2008; Kreuter & Strecher, 1996; Kreuter, Strecher, & Glassman, 1999; Noar, Benac, & Harris, 2007). Therefore, a key design element of mDad was to implement message tailoring to enhance the relevance of the content to individual fathers (see Figure 1). Specifically, content was tailored to the age of the target child and to whether the father was a residential or non-residential father.

Figure 1. Design elements of mDad

Tailoring	Personalizing	Targeting	Framing
• Age of child • Non-residential vs. residential • Number of children	• Names (user, partner, child) • Child gender	• Use of humor • Non-clinical language • Topics important to dads • Parenting resources list	• Messages are positively framed • Messages underscore importance of dads

Further, the content was designed to be father-friendly and personalized to each user. We consulted with a fathering expert and a comedian, both of whom made numerous suggestions to enhance the accessibility and father-friendly nature of the content by using humor and "buddy language" (i.e., the voice of a dad talking to another dad). The fathering expert also made suggestions for fun father-child engagement activities.

Methods

Introduction to Usability and Acceptability Testing

While the research team worked on multiple rounds of content development, we also engaged in acceptability and usability testing of "beta mDad" with fathers. Usability testing examines the user experience in navigating through the features of an app, whether the technical aspects of the app function well, and whether features of the app are intuitive to the user. Another goal of usability testing is to identify potential challenges or barriers that participants might encounter in using the technology (Kaufman et al., 2003). Acceptability testing examines if the content resonates with the intended user; in our case, we focused on whether men found the content of the push notifications and engagement activities to be relevant, useful, and consistent with their fathering experiences.

The next section describes the data gathered through several rounds of usability and acceptability testing with fathers, using a convenience sampling approach. Data collection included (a) in-depth, one-on-one interviews to gather fathers' response to mDad messages and other content as it was being developed; (b) in-depth, one-on-one interviews with individuals who used and provided feedback on the beta version of the app; and (c) focus groups and small group discussions on the final version of mDad content, using screenshots gleaned directly from the app. Our preliminary studies, described above, examined fathers' access to parenting information and sources of parenting support in early fatherhood, whereas the usability and acceptability testing focused on fathers' engagement with the actual content of the mDad beta app. All research procedures were reviewed and approved by the University of Michigan Institutional Review Board.

Study Procedures

All interviews and focus groups used a semi-structured format, covering a list of topics and questions defined by the research team in an interview guide. Different questions were asked in the interviews conducted as usability testing than those conducted as acceptability testing. One-on-one interviews were conducted by a member of the research team who was either involved in the tech development or in the content development. Interviewers took detailed notes on the conversation. Focus group were usually facilitated by trained male

facilitators who were not members of the research team or authors of this study. Often, a member of the research team observed the focus groups and took notes. When a member of the team was not available to observe and take notes, focus groups were audio recorded for review by the research team.

Data Analysis Plan

For analysis, the two study authors independently reviewed notes from the interviews to identify important concepts and themes in the data, read and reread each transcript in an iterative fashion to discern any previously unrecognized concepts and themes, and arrived at a consensus on themes emerging from the transcripts and interviews. It is important to note that the goal of our usability and acceptability testing was to inform and refine development of mDad, not necessarily to derive research hypotheses, answer research questions, or generate generalizable conclusions. This is reflected in our methodology, which uses an exploratory data collection method and data analysis approach that is highly descriptive and specific to the context of our study only.

Measures

Usability Interviews

A male member of the technology development team conducted the first iteration of usability testing. These interviews used a semi-structured usability testing script. The interview opened with the statement, "I am going to show you some screen shots and sketches that we have made of our design ideas. I'd like to discuss these ideas with you and get your opinions." Participants were presented with a series of scenarios and asked, "I am going to give you a scenario and ask you to do some tasks. As you are completing each task I want you to 'think out loud' as you decide which button to push and where to go within the site. I am going to ask you as much as possible to try and understand how you are looking at it, what you are trying to do, and what you are thinking." A small number of young men (n=4) recruited from the University of Michigan student population examined mock-ups of the mDad user interface.

Acceptability of mDad Content to Military Fathers (Team RWB)

Following the first round of usability testing, a member of the research team conducted in-depth acceptability interviews with military fathers (n=9) who had at least one child 3 years or younger. These interviews focused on the acceptability of mDad content, including usefulness and relevance to their experiences as service members and fathers of young children. Respondents were recruited through the Facebook page for the nonprofit veterans' organization Team Red, White, and Blue. The fathers who provided feedback were either active military personnel or recent veterans. To gather feedback on a broad range of content, the fathers were sent samples of parenting education content to review, including messages for a father of a 1- to 2-month-old child and a father of an 11- to 12-month-old child. Each father offered his feedback during a brief (15 to 30 minutes) phone call as part of a semi-structured interview with a member of the research team who took detailed notes during the phone call. The interviewer followed an interview guide that

asked participants to describe their overall impression of the sample messages; whether the content was interesting and relevant; whether the language and the tone was accessible and engaging; and what topics they would like to see added, expanded, or excluded. These fathers were also asked for suggestions for making content more relevant, accessible, and engaging. Two researchers reviewed this initial feedback and used it to refine the parenting content.

Acceptability and Usability Testing with mDad Beta Users

In the next iteration of testing, we conducted in-depth assessment of usability and acceptability of mDad content with fathers (n=4) who used the app for 8 weeks. Semi-structured interviews regarding acceptability of content were conducted over the phone, and usability questions were delivered via a brief online survey. A member of the research team conducted the interviews and took detailed notes on the feedback provided. Following an interview guide, the interviewer asked fathers whether they found content useful and relevant to their parenting, if there were specific components of the mDad app that they particularly did or did not like, if the tone in which information was delivered was appealing, whether they found the app easy or difficult to navigate, whether there were content areas not covered that they would like to see included in the app, whether they would recommend the app to a father friend, and if they had suggestions to make the app something they would be more likely to use or recommend to a friend. The four fathers who participated in this iteration of testing were again recruited through veterans' organization Team Red White & Blue, and all were fathers of young children who were either currently serving in the United States military or had a history of military service. Three respondents were interviewed at the conclusion of the 8-week pilot test, and one was interviewed in the middle of the testing period, prior to a scheduled deployment.

Acceptability Focus Groups with Urban, African American Fathers

The research team also conducted six focus groups with a total of 27 men. Respondents were all African American and ranged in age from 21 to 62 years. All of the men identified as having experience with parenting, and all except one participant self-identified as a father or surrogate father. The majority had at least one child currently living at home, and the ages of the children currently living at home ranged from newborns to 32 years of age.

In this phase of the project, we created a detailed handout about mDad. We used screen shots of the mobile app to show key functions of the app. We also highlighted several parenting education messages from the app. The goal was to get feedback from men regarding the acceptability of the content and functionality of mDad. Again, we used a semi-structured format and all focus group facilitators followed an interview guide. Questions included, "mDad provides functions like uploading pictures of your baby and recording when they accomplish milestones, like their first tooth or eating new foods. What do you think about this function? Would you use a function like this?" and "mDad also provides dads the option of creating 'logs' which are little notes about your baby, such as 'baby's favorite things to do' and 'things dad did to make baby smile.' Do you think you would use a function like this?" To examine the acceptability of the mDad messages, we provided sample messages directly from the app and said: "This is the kind of information

that mDad provides. Is this information interesting to you? Do you think it would help you as a dad? Do you think it is engaging to you as a father?"

Results

Usability Interviews

In the first round of usability interviews focusing on the layout of the app features and functionality of the app, men made several suggestions for how to improve the user interface and the features of the app to make it easier to use and navigate. In general, these young men rated themselves as very familiar with and comfortable using computers and other electronic devices. Respondents provided feedback on how to improve ease of use, reduce visual clutter, and make cues more intuitive, for example, making the camera icon easier to access.

Acceptability of mDad Content to Military Fathers (Team RWB)

Fathers indicated that their overall impression of mDad content is that it is interesting and relevant to them. They found the information provided on developmental milestones to be interesting and accessible, liked the friendly, non-pedantic tone, and appreciated the brevity and specificity of the messages. They liked the features that allow shared participation with a co-parent and virtual tracking of their child's development and said that these features make the app highly engaging.

Fathers were most enthusiastic about the activity suggestions offered by mDad; they reported that these suggestions were useful and appealing and gave them new ideas for things to do with their young children. For example, the sample content for the father of a 1- to 2-month old explained that "It may seem like babies can't do much... but they come pre-wired with some amazing abilities." A brief explanation of baby reflexes was followed by suggestions of how fathers could test and observe their baby's reflexes (e.g., test and observe the grasping reflex by touching the palm of the baby's hand and seeing if the baby grabs onto their finger). Several fathers reported trying the suggested activities with their young children and enjoying them and said they had tried things they would not have thought to do without the prompt from mDad.

Fathers who reviewed sample content suggested the content could be improved in future iterations through increased tailoring. For example, the father of a child with special needs said that it would be very helpful for him if mDad offered specific ideas for activities suited to children with diverse needs. A father of two said that he would appreciate ideas for activities that he could engage in with both his young child and older child because he is usually with both children together.

Acceptability and Usability Testing with mDad Beta Users

Feedback was positive and suggested that a broad cross-section of military fathers (including first-time and experienced fathers of varied ages and relationship status) found the app content interesting, useful, and relevant to their parenting experiences. For example, one father said the content was relevant to him even as an experienced father:

> I love the app. At first I thought it would be more useful for first-time fathers, but it turned out to be so helpful even though I already have kids - it reminded me all kids aren't the same and helped me try new things.

Fathers who both were and were not at home with their children at the time of using mDad found the app useful and the content relevant. For example, one military father who was away from his family on a temporary duty assignment said he used the app to keep up with his spouse about what their baby was doing.

Functions such as logging a child's developmental milestones and receiving tailored parenting education were perceived favorably. Fathers found the personalization and customization of the app to be a great strength. Fathers indicated that they found the activity suggestions useful, the tone of the messages appropriate and appealing, and the features of the app easy to navigate. They appreciated the tone of the app for being both educational and humorous. Moreover, they found the content well suited to their needs and interests as fathers of young children. In particular, these fathers noted that they valued the suggestions of developmentally appropriate activities for engaging with children at a specific age.

The mDad brief messages were described as more useful than long books or dense websites that the fathers would have to sift through for information relevant to their particular circumstances. Fathers reported that the frequency of messages and level of detail provided met their needs. In the words of one father:

> I get sick of apps that send too much information or send things too often. This app didn't send too much, so I never got tired of it. When I saw I had an update, I wanted to see what it was, and I went straight into the app. I always found information that was relevant for me and my son.

Specifically, fathers liked the app medium of delivery because it made relevant parenting information available and accessible whenever and wherever they had time and interest. Fathers described looking through mDad activity suggestions and reading through app content as a productive thing to do (replacing less productive online activity) when they had a few spare moments such as waiting for an appointment. The timing of the messages – delivered on Tuesdays and Fridays – was rated as highly favorable; fathers reported that the messages helped to plant the seed for things to do over the weekend when they had the most family time.

Participants varied in their assessment of the relative importance of specific message topics but agreed that, overall, the topics were on point. They felt the app would be especially useful for first-time fathers but would also be useful for more experienced fathers. All participants agreed they would use mDad and would recommend the app to other fathers.

Acceptability Focus Groups with Urban, African American Fathers

Similar themes emerged in our discussion with urban, African American fathers. For example, participants indicated that they liked the language in the app and found the humor to be engaging as well. They liked the functionality of receiving push notifications as a reminder. In general, these fathers expressed enthusiasm about mDad and about having

readily accessible parenting resources in the form of information on their phone. Participants noted that even when parents are not together, it is important for dads to learn about and connect with their baby, and they liked the accessibility of the app. Furthermore, they favorably rated the tailoring and personalization of mDad.

When we asked fathers to rate the acceptability of specific mDad messages, respondents rated favorably content on baby proofing, child development, and ideas for engaging with the baby or toddler. Numerous fathers indicated that some of the content, such as the notion of swaddling, was new to them. These fathers also had suggestions for ideas that they thought would improve the app, including a social networking feature that would allow users to share photos and videos with a wider network of friends and family, for example, connecting the app to Facebook or Instagram. Other suggestions included content for parents with children who have special needs.

Discussion

As noted in the introduction, smartphone use in American society is increasingly widespread and especially common among those individuals whom social workers are often trying to more effectively reach with social work interventions – for example, young people, low-income individuals, and members of racial and ethnic minority groups. However, many barriers still exist to the implementation and dissemination of technology-based interventions in community contexts. For a variety of reasons, those most in need of intervention might be less likely to receive such services. For example, factors such as low health literacy have been shown to hinder receptivity to Text4Baby messaging (Gazmararian, Yang, Elon, Graham, & Parker, 2013). In our case, focus groups and interviews with men suggested that a pedantic tone would hinder fathers' receptivity to mDad messages, so we focused on making the messages more engaging by using a warm and humorous tone. Specifically, we used a humor consultant to transform the tone—and hence the user experience—of the app so that fathers find mDad engaging. In addition, each member of our multidisciplinary research team contributed content-specific expertise to mDad development. However, the numerous rounds of revising content by each team member were time and resource intensive. In parallel with the research team developing and revising content, we conducted four separate rounds of acceptability and usability testing, as detailed above, which took well over a year.

An advantage of technology-based approaches is the option of tailoring interventions to the individual user. E-health research focusing on improving physical health outcomes has shown that tailoring messages can enhance intervention effectiveness (Hawkins et al., 2008; Kreuter, Lukwago, Bucholtz, Clark, & Sanders-Thompson, 2003; Kreuter & Strecher, 1996; Kreuter et al., 1999). Participants in our study provided positive feedback about the personalization and tailoring of mDad messages. Some feedback suggested that more extensive tailoring would make the app even more acceptable to fathers. For instance, one father whose child has developmental delays said he would have found it helpful to receive content addressing parenting a child with special needs. Similarly, several divorced fathers suggested adding content on co-parenting after divorce. However, tailoring can present several challenges. Given the extent of possible dimensions on which to tailor messages, priority areas must be determined. Each tailoring element requires extensive

research to identify how content should be adapted to maximize relevance in response to the specific tailoring element. The current understanding of how best to tailor content of technology-based psychosocial interventions to underserved individuals is still quite limited.

Researchers will appreciate the possibility of enhanced data collection using technology. Technology-based interventions can both facilitate traditional forms of data collection and support new approaches. Website analytics enable researchers and developers to collect user data passively and track a variety of user interactions such as the type of content participants read and return to most (and least) frequently. Site analytics can also track whether users follow links to additional resources, including who and how many follow each link; the frequency with which fathers write in the log and what they write about; how often fathers upload pictures and videos and what they document; and which users use the app independently and which use it with a partner. Survey data and user data can be integrated to inform better understanding of under what conditions the intervention is most effective, and whether dosage (frequency with which fathers engage with the app) corresponds to gains in father engagement as measured via survey.

Last, although technology has enormous potential to reach individuals with great ease, dissemination remained a challenge in our experience. The ability to engage a large number of potential users requires buy-in from stakeholders. Traditional methods of recruitment (e.g., flyers and bulletin board postings) are unlikely to be effective for an app. The approach most likely to be effective is leveraging a close connection to community collaborators who can help with the dissemination process. Recruitment was challenging, but the fathers we reached were overwhelmingly positive and recommended the app to others. The positive participant response suggests it is not only worthwhile to invest in varied and creative recruitment strategies but also a promising strategy to invite early adopters to support dissemination by recruiting friends. Reaching even a small number of people is meaningful if they would otherwise not be served because existing interventions are either inaccessible or unappealing to them; technology-based interventions thus hold great promise for expanding access for underserved populations. Once taken to scale, technology-based interventions offer a cost-effective approach because the major costs are in the initial outlay and many additional users can be added at minimal costs.

Conclusion

This study has a number of implications for the use of technology in social work practice. It suggests that delivery of tailored parenting information via smartphone app has the potential to make psychosocial interventions more engaging, more efficient, and less expensive, while reaching clients who might otherwise not be served by traditional parenting programs and services. However, challenges associated with this type of approach include the substantial investment needed up front to develop a high-quality, technology-based intervention. The mDad app and similar uses of technology in social work practice are in the early stages, and further studies are needed to evaluate and enhance the efficacy of this type of highly promising intervention.

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