Grow Online: feasibility and proof of concept study

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Abstract

Purpose – *Digitally delivered, parent-focused interventions (DD-PFIs) are viewed as an important method for supporting child well-being. Few DD-PFIs include health-promotion and general-parenting content, and only some are intended for a universal audience. The purpose of this paper is to focus on a preliminary evaluation of Grow Online, which was designed to address this gap.*

Design/methodology/approach – *A mixed-methods design, including pretests and posttests and semi-structured interviews, was employed to evaluate program feasibility and demonstrate proof of concept.*

Findings – *Feasibility findings were favorable, which indicates participants were satisfied with the program, liked the main program features, found the content helpful and had a positive experience using the website. Initial recruitment was strong, and engagement with the sessions was high; however, retention was poor with a 73.5 percent attrition rate. Significant pre- to post-changes were found on measures of over-reactive discipline, parenting efficacy, emotion coaching, coping socialization, child physical activity support, rewarding eating and child externalizing and internalizing behaviors.*

Research limitations/implications – *Study design and high attrition limit the ability to infer causality and generalize beyond the sample.*

Practical implications – *Providing support to parents through a universal health-promoting DD-PFI is viable, though issues involving retention need to be given full consideration.*

Originality/value – *Parents use of technology to access child care information is increasing, but most information online is not evidence-informed. Grow Online fills an important gap in the research and practice of DD-PFIs, and this study's findings suggest a more rigorous evaluation is merited.*

Keywords *Health promotion, Feasibility, Child well-being, Digital delivery methods, Parent-focused interventions, Proof of concept*

Paper type *Research paper*

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Introduction

Several factors (e.g. peers, media and school environment) influence child health and well-being, but parents continue to be the primary agents of change for their child's behaviors and lifestyle (Bornstein, 2015; National Academies of Sciences, Engineering and Medicine, 2016). Parents can be empowered in this role through parent-focused interventions (PFIs), which center on enhancing parents' competencies and strengthening the parent-child relationship (Prinz, 2016).

An extensive evidence base demonstrates the effectiveness of PFIs for improving parent and child outcomes (Finders *et al.*, 2016; Shah *et al.*, 2016). Thus, the National Academies of Sciences, Engineering and Medicine's (2016) Committee on supporting parents of young children strongly recommended that the US Department of Health and Human Services continues to advocate for the utilization of evidence-based PFIs and supports efforts to expand them for wide-spread delivery. This second recommendation noted reach as a major limitation of PFIs (MacDonnell and Prinz, 2017; Prinz and Sanders, 2007).

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Digitally delivered PFIs and their current limitations

Within the PFI public-health framework, there has been growing interest in using digital delivery methods (e.g. online platforms and mobile devices; Baker *et al.*, 2017; Breitenstein *et al.*, 2017). These digital delivery methods are thought to be especially useful for optimizing reach and overcoming several key program participation barriers (e.g. transportation, schedules and child care; MacDonnell and Prinz, 2017). Furthermore, mobile devices and access to the internet are fairly commonplace in modern society. Recent estimates suggest 77 percent of US adults own a smartphone, and 89 percent use the Internet (Pew Research Center, 2018a, b).

Multiple reviews (Breitenstein *et al.*, 2014; Hall and Bierman, 2015; Nieuwboer *et al.*, 2013) concluded that digitally delivered PFIs (DD-PFIs) are feasible and yield favorable program satisfaction and usability results. Furthermore, several reviews have reported DD-PFIs to have significant impacts on parent and child outcomes (e.g. parenting practices and youth behavioral problems; Breitenstein *et al.*, 2014; Baumel *et al.*, 2017; Hall and Bierman, 2015; MacDonnell and Prinz, 2017; McGoron and Ondersma, 2015; Nieuwboer *et al.*, 2013).

The current state of the evidence suggests there is utility to delivering PFIs digitally, yet limited research has been conducted on universal programs (Owen *et al.*, 2017). Given that universal prevention focuses on providing support to the general population regardless of risk level (IOM, 2009), the dearth of research studies on this type of programming creates a gap, especially since the use of digital delivery methods has been described as one essential strategy for implementing a public-health approach to PFIs (Baker *et al.*, 2017).

Another limitation of the current DD-PFI literature base is that a lack of programs exist that include health-promotion alongside general-parenting content. Given the important role parents play in fostering all aspects of their child's health (National Academies of Sciences, Engineering and Medicine, 2016), a logical next step for DD-PFIs would be to begin including health-promotion content. This is particularly relevant considering the prevalence of childhood obesity in the USA (Ogden *et al.*, 2014) and research findings that suggest US children are not meeting national recommendations for physical activity (Fakhouri *et al.*, 2013), fruit and vegetable intake (National Cancer Institute, 2015), sugar-sweetened beverage consumption (Rosinger *et al.*, 2017) and screen time usage (US National Library of Medicine, 2017).

The Grow Online parenting program, examined in this study, was developed to address the identified gaps in the extant literature on DD-PFIs. Grow Online is a universal health-promoting PFI, developed for US military and civilian parents with elementary school-age children, that teaches parents about positive parenting, stress management and health promotion in an effort to promote child well-being. The feasibility of Grow Online is investigated by examining program recruitment, engagement, acceptability, appropriateness and website usability. Proof of concept is explored by examining pre- to post-program change in participants on parenting, stress management and health-promotion measures. Because Grow Online is a newly developed program, this exploratory study is required to determine if this program warrants further and more rigorous evaluation (Czajkowski *et al.*, 2015).

Method

Study design

Data were drawn from a small mixed-methods study ($n = 59$) that employed a sequential explanatory design. Specifically, a two-phase design was used where quantitative data were collected first using a single-group pretest and posttest design. This was followed by the collection of qualitative interview data that further explained and helped us interpret the findings from the survey answers (Creswell and Plano Clark, 2017). Conducted in 2017, the

study's purpose was to collect preliminary information on implementation (Proctor *et al.*, 2011) and treatment outcomes for Grow Online.

Sample

Participants were recruited through word of mouth and social media postings. To participate, individuals had to be at least 18 years old; a parent or guardian of a child between the ages of 5 and 10 years old; and fluent in English, which is the language of instruction for Grow Online. Two implementation periods were offered, so participants could choose the timing that worked best for their schedules. Recruitment occurred over the two-week period that preceded the first program start date. Details on recruitment numbers are provided in the results section. The demographic characteristics of those involved in the program are presented in Table I. This table also contains the demographic details of the eight parents who participated in a single, semi-structured phone interview.

Intervention

Grow Online is a web-based adaptation of the Grow Face-to-Face (Grow F2F) parenting program (Czymoniewicz-Klippel *et al.*, 2017; Chesnut *et al.*, 2018). Grow F2F is a universal prevention program delivered in a group format to about ten parents/caregivers, over five weeks, by a certified facilitator using a video-based curriculum. In 2016, a decision was made to adapt Grow F2F for online delivery to potentially improve reach and access to the program. Due to the change in mode of delivery, modifications were made to the number and length of sessions to promote parent retention and were also made to the content and delivery system of the prompts and the format of the reflection activities that start each session. However, no content was added or removed during the adaptation process to maximize the comparability of the program versions (see Czymoniewicz-Klippel *et al.*, 2019).

Grow Online is delivered to parents via a custom, online learning management system (LMS). The program is self-paced; however, it is recommended that parents complete one module per week to allow for between-module practice (Breitenstein *et al.*, 2017). While they cannot skip ahead, parents are able to return to completed content at their convenience. Grow Online can be accessed on a desktop or laptop computer or on a handheld device (i.e. tablet or smartphone). Eight modules teach evidence-based strategies for promoting positive parenting behavior, stress management in parents and children and healthy child physical development. Modules 1–3 focus on parenting styles and positive parenting strategies (e.g. praise and encouragement); Module 4 discusses child health promotion at home; Modules 5 and 6 address child behavior management skills; Modules 7 and 8 promote parent and child stress management. Each module is estimated to take approximately 35 min to complete.

The Grow Online modules comprise consistent features or strategies for presenting the content and promoting application of the taught parenting skills:

1. Brief (i.e. 1–3 min) video segments, drawn from the original Grow F2F curriculum, visually demonstrate the parenting concepts, skills and strategies included in the program.
2. Interactive activities, including multiple choice and short-answer questions, drag-and-drops and fill-in-the-blanks, promote parent engagement with the module content.
3. Brief case study knowledge check questions (react) promote learning and retention of the module content.

Table I Participant demographics

Characteristic	*Program* (n = *48)*	*Interviews* (n = *8)*
Gender (%)		
Female	93.8	85.7 (*n*=7)
Age (%)		
18–24	2.1	0
25–34	27.1	25
35–44	62.5	62.5
45 or older	8.3	12.5
Race/ethnicity (%)		
White	86.4 (*n* = 44)	87.5
Education (%)		
No high school diploma/GED	0	0
High school diploma/GED	4.2	0
Some college	4.2	0
Vocational training	4.2	0
College degree	87.6	100
Occupation status (%)		
Full-time (paid)	43.8	50
Part-time (paid)	10.4	0
Stay-at-home parent	41.7	25
Other	4.1	25
Military affiliation		
Active duty	16.3	14.3
National Guard or Reserve	4.7	0
Former service member	2.3	0
Spouse of a service member	37.2	57.1
Civilian, no affiliation	16.3	0
Other	23.2 (*n* = 43)	28.6 (*n* = 7)
Marital status (%)		
Married	93.7	87.5
Divorced	2.1	0
Never married	4.2	12.5
Other	0	0
Family arrangement (%)		
Two-parent family	93.7	87.5
Single-parent family	4.2	12.5
Step family	2.1	0
Target child		
Age (*M*, SD in years)	7.09 (1.69)	7.43 (2.23) (*n* = 7)
Male (%)	60.9 (*n* = 46)	71.4 (*n* = 7)

4. Skills-based homework practice activities (interact) encourage parents to think about their own parenting circumstances, set explicit parenting goals that relate to the module content and practice at home.
5. Open-ended homework reflection questions (reflect) support parents as they reflect on their experiences practicing the skills at home.
6. Documents in downloadable PDF format provide further information and resources on important parenting topics that are briefly mentioned in the module content (Parent Tools) and summarize the content and skills taught in each module (strategy cards and Session Summary PDFs). These documents are housed in a Parent Toolbox and are interspersed throughout the modules as appropriate.

Procedures

Ethical approval for the study was received from the research team's university before starting the study. Prior to being given access to the program, participants were asked to complete the study's online pretest, which included a number of measures designed to assess the program's primary treatment outcomes (see following section). Participants accessed the pre-test, which was housed in the online survey platform Qualtrics, via a secure link sent to the e-mail address they provided at registration. Participants who completed the pretest were sent login information the day before their scheduled start date and were instructed to test their login credentials to ensure they worked properly. The following day, participants were notified that the program was open and were reminded of the targeted completion date, which was set for ten weeks' post-program start. While the modules were set to unlock sequentially and immediately after the previous one was completed, the parents were asked to finish the modules at a rate of one per week.

E-mail prompts were sent to parents to encourage program retention. Parents who were behind schedule based on their last login date (e.g. had not logged into the program in over ten days), received an e-mail reminder to encourage participation. A maximum of three reminders were sent to each parent. The parent was removed from the research study if, after three e-mails were sent, inactivity continued. However, in this case, the parent could continue to have access to the program should he or she wish to continue reviewing the modules on his or her own. None of the participants who received three reminders ($n = 23$) continued to review the modules. Technology support was provided by the research team during business hours via telephone and e-mail.

Upon program completion, participants were post-tested in the same manner they were pre-tested. They received a $20 e-gift card for each completed survey. After the post-test data collection period ended, a subset of participants was invited to participate in a post-program telephone interview for which they received an additional $20 e-gift card. Parents were selected solely on the basis of their program completion status: completer – finished all program sessions, non-completer – started but did not finish the program and drop-out – never started the program. The interview participants were primarily program completers ($n = 5$) followed by non-completers ($n = 2$) and drop-outs ($n = 1$). The interviews were conducted by the research team and focused on eliciting participants' experiences with the program and its implementation. A semi-structured interview schedule was used to prompt parents to discuss specific aspects of the Grow Online curriculum and implementation that facilitated or inhibited their engagement and retention in the program, such as relevance of the program content, length and flow of the modules, LMS accessibility and ease of use and personal factors influencing participation. The interviews lasted, on average, 40 min; all were recorded on MP3 with participant permission.

Feasibility measures

Recruitment was assessed by the total number of participants who completed the program's self-registration survey.

Engagement was assessed by participant retention rates, session completion, program usage patterns, use of interactive elements (e.g. reflects and quizzes) and responses to a single-item question on session engagement measured on a five-point scale.

Acceptability and appropriateness were primarily assessed by the eight-item Client Satisfaction Questionnaire (CSQ-8; Larsen *et al.*, 1979) included on the post-test. Larsen *et al.* (1979) found evidence of adequate internal reliability and validity. Cronbach's α was 0.89. In addition, a single-item, general-satisfaction question, measured on a five-point scale, was presented to participants at the end of every session. At last, at the very end of the program, participants responded to a set of five items that asked how much they liked different aspects of the program. Each item was measured on a four-point scale.

Website usability was assessed by three items that participants responded to after completing the final session, including overall experience with the program (five-point scale); finding the website confusing (yes/no) and, if so, what they found confusing (open-ended); and experience improvement feedback (open-ended).

Proof of concept measures

The Grow Online program focuses on three overarching learning domains: positive parenting, stress management and health promotion. Program content and activities are designed to enhance relevant outcomes related to each of these domains. The following measures correspond to the program's learning domains. In many cases, subscales from larger measures were selected because our desire was to be thorough while also not overburdening participants by administering multiple, lengthy scales.

Alabama Parenting Questionnaire – Short Form (Elgar et al., 2007). The three-item inconsistent-discipline subscale, from the nine-item total scale, was used. Elgar *et al.* (2007) reported adequate internal consistency and evidence of discriminant and construct validity. Cronbach's α was 0.79 at pre-test and 0.80 at post-test.

Parenting Scale (Arnold et al., 1993) The five-item over-reactive discipline subscale, of the original 30-item scale, was used (Rhoades and O'Leary, 2007). Rhoades and O'Leary (2007) reported good internal reliability and evidence of convergent validity. Cronbach's α was 0.78 at pre-test and 0.72 at post-test.

Strengths and Difficulties Questionnaire (SDQ; Goodman et al., 2010). The externalizing, internalizing and prosocial behaviors subscales, of the 25-item scale, were used. Goodman *et al.* (2010) reported adequate internal reliability and evidence of construct and discriminate validity. Cronbach α for externalizing, internalizing and prosocial behaviors was 0.82, 0.77 and 0.80 at pre-test and 0.75, 0.56 and 0.79 at post-test, respectively.

Parental Stress Scale (Berry and Jones, 1995). The seven-item parental stressors subscale, of the original 20-item scale, was used. Oronoz *et al.* (2007) reported adequate internal reliability and evidence of construct validity. Cronbach's α was 0.91 at pre-test and 0.89 at post-test.

Parental Locus of Control Scale (PLOC; Campis et al, 1986). The nine-item parental efficacy subscale, of the original 25-item scale, was used. Campis *et al.* (1986) reported adequate internal consistency and evidence of construct and discriminate validity. Cronbach's α was 0.85 at pre-test and 0.67 at post-test.

Maternal Emotional Styles Questionnaire (MESQ; Lagace-Seguin and Coplan, 2005). The seven-item emotion-coaching subscale, of the original 14-item scale, was used. Prior research reported adequate internal reliability for mothers and fathers and evidence of construct validity (Baker *et al.*, 2011; Lagace-Seguin and Coplan, 2005). Cronbach's α was 0.62 at pre-test and 0.72 at post-test.

Socialization of Coping Questionnaire (Monti et al., 2014). The seven-item primary control engagement and five-item cognitive restructuring subscales, of the original 24-item scale, were used. Monti *et al.* (2014) reported adequate internal reliability and evidence of construct validity. Cronbach's α for primary control engagement and cognitive restructuring was 0.83 and 0.89 at pre-test and 0.85 and 0.90 at post-test, respectively.

Healthy Habits Questionnaire (HHQ; 5210 Let's Go, 2012). Six items from the original ten-item scale were used to assess food/drink consumption, screen time usage and physical activity. No previous psychometric information was available; each question was treated as a single-item because there is no theoretical rationale for creating a composite measure.

Home Environment Survey (Gattshall et al., 2008). The five-item physical activity parental-policies subscale, of the original 118-item instrument, was used. Gattshall *et al.* (2008)

reported adequate internal reliability and evidence of construct validity. Cronbach's α was 0.78 at pre-test and 0.82 at post-test.

Feeding Practices and Structure Questionnaire (Jansen et al., 2014). The six-item reward for behavior and six-item reward for eating subscales, of the original 40-item scale, were used. Jansen *et al.* (2014) reported good internal consistency and evidence of construct validity. Cronbach's α for reward for behavior and reward for eating was 0.81 and 0.73 at pre-test and 0.89 and 0.76 at post-test, respectively.

Data analysis

Quantitative data were analyzed using SPSS version 24. For feasibility outcomes, descriptive statistics were generated, including means, standard deviations, medians, frequencies, ranges and percentages. Examination of pre- to post-change on study variables was done using Wilcoxon signed-rank tests because visual and statistical (e.g. Kolmogorov–Smirnov test) inspections of the data indicated the normality assumption was violated. Furthermore, given the small analytic sample size ($n = 22$), the use of a non-parametric test, which is more conservative, was deemed more appropriate than a parametric test (Field, 2013). The *r* effect size was calculated to help quantify magnitude (Field, 2013). Cohen's (1988) guidelines were employed to aid in interpretation: 0.1 (small), 0.3 (medium) and 0.5 (large).

An inductive thematic approach, in which themes and subthemes were allowed to emerge from the data using techniques such as reading and re-reading the interview transcripts to identify patterns and repetitions (Markovic, 2006), was used to analyze the qualitative data. Pre-conceived themes, developed on the basis of our reading of the program evaluation literature and reflected in the structure of the interview schedule, were applied during the initial analysis of the transcripts. NVivo 7 was used to manage these data. Interview recruitment ended when the interviewing researchers determined inductive thematic saturation was achieved (Saunders *et al.*, 2018).

Results

Recruitment and engagement

At the end of the recruitment period, 83 individuals signed up for one of the two program implementations. Initially, Cohort 1 included 30 people, and Cohort 2 included 53. In total, 18 participants were employees of the research institute and, as such, were ineligible to receive compensation as research participants due to university protocol. These individuals were contacted by a member of the research team to confirm their continued interest. Seven declined further participation, and one never responded. The remaining 75 participants (Cohort 1 = 29; Cohort 2 = 46) were considered study participants.

In all 59 individuals (71 percent) completed the pre-test and were given login credentials to access the program on their cohort's respective start date. In total, the 16 participants who were lost at this stage were from Cohort 2. Prior to Cohort 1's start date, six individuals contacted the research team and requested to be moved to Cohort 2 due to scheduling conflicts. Thus, on their respective program start dates, Cohort 1 had 23 participants and Cohort 2 had 36.

In all 48 participants started the first session, and 39 completed it. Completion rates declined for Sessions 2 ($n = 31$), 3 ($n = 29$) and 4 ($n = 27$) but stabilized for Sessions 5–8 ($n = 25$). In total, 22 of the participants who completed the program also completed a post-test survey. Thus, the retention rate from the beginning of recruitment until the end of the research study was 26.5 percent (22/83). No statistically significant demographic or baseline differences were found between those who completed the post-test and those who did not. Similar results were found when comparing program completers and

non-completers. However, when comparing program completers' and non-completers' time between sessions, it was observed that significantly fewer days elapsed between program start and completion of Session 1 for completers (Mdn = 4.00; Range = 0–27 days) than non-completers (Mdn = 9.00; Range = 1–53 days), $U = 82.5$, $z = -2.72$, $p = 0.007$. No other differences were observed.

In general, program completers' time between finishing sessions was one week (Mdn = 8.00). However, there was considerable variation in the time participants took between sessions throughout the program (Range: 0–36 days). Table II displays descriptive statistics for the time between each session. A significant increase in time between sessions was detected over the first five sessions, $\chi^2(4) = 9.64$, $p = 0.047$. However, from the fifth to the final session, there was a significant decrease, $\chi^2(3) = 20.81$, $p < 0.001$. These findings suggest program completers' time between sessions followed a curvilinear trajectory over the course of the study.

Program completers finished all eight sessions in approximately two months (Mdn = 64.00 days; Range: 35–73). None of the participants consistently followed the recommended pace of completing one session a week. In fact, 72 percent completed multiple sessions simultaneously at least once. A visual inspection of the data revealed that completing multiple sessions at one time occurred slightly more frequently after Session 4 (15 occurrences) than before (9 occurrences). Furthermore, the pattern of simultaneously completing sessions differed before and after Session 4. Prior to Session 4, the majority of occurrences (78 percent) involved completing two sessions simultaneously. The remaining 22 percent involved completing three, simultaneous sessions. After Session 4, there was more variability with 66 percent of occurrences involving two, 7 percent involving three, 20 percent involving four and 7 percent involving five, simultaneously completed sessions. Interestingly, 40 percent of the sample completed Sessions 7 and 8 simultaneously.

Throughout all sessions, program completers demonstrated high levels of engagement as assessed by their use of the program's interactive elements (e.g. reflects and quizzes) and self-report. In general, program completers provided responses to the vast majority of the program's interactive elements (Mdn = 96 percent, Mdn_{Range} = 93.8–100 percent). A similar pattern emerged with the self-reported session engagement data, which were measured on a five-point scale (Mdn = 4.50, Mdn_{Range} = 4–5). In both cases, no significant differences in engagement scores across sessions were found.

Acceptability and appropriateness

In all 22 program completers provided responses to the CSQ-8. CSQ-8 total scores suggest the participants were very satisfied with the program (Mdn = 29.5; Mode: 32; Range: 22–32). For all eight items, the vast majority of completers endorsed the two highest response options of 3 or 4 (Mode: 100 percent; Range: 90.9–100 percent). The lowest response option selected was 2, which reflects a slight negative endorsement of the item.

Table II Time between session descriptive statistics

Timeframe	*Mdn (range)*
Program start–Session 1	4.00 (0–27)
Sessions 1–2	7.00 (0–22)
Sessions 2–3	8.00 (0–36)
Sessions 3–4	7.00 (0–35)
Sessions 4–5	10.00 (0–32)
Sessions 5–6	8.00 (0–21)
Sessions 6–7	3.00 (0–23)
Sessions 7–8	2.00 (0–11)

Note: Time is measured in days

This was only selected for three items (i.e. program quality, program met needs and participate in program again), and no more than two participants endorsed this response for each of those items. Program completers' responses to the five-point satisfaction question asked at the end of every session provide additional evidence that they found the program to be acceptable (Mdn = 4.5; Mdn_{Range}: 4–5).

Program completers also provided favorable responses to questions that asked them about how much they liked or disliked the video segments, the Parent Toolbox, the interactive activities, the interact exercises and the practical strategy cards. For each of these features, the majority selected "liked a little" or "a lot" (Range: 85–100 percent). For the Parent Toolbox, interact exercises and practical strategy cards, at least one participant, but no more than two, chose "disliked a little." The video segments received the lowest ratings from the most participants, with two participants selecting "disliked a little," and one selecting "disliked a lot."

All parents who participated in an interview expressed broad satisfaction with the program. When asked to share their overarching thoughts on the program, many parents talked of their general satisfaction with the program content, structure/flow and activities. Furthermore, while some parents encountered minor technical difficulties in accessing the modules, these difficulties were easily overcome (e.g. with technical assistance from the research team); overall, these parents felt that the program website was easy to use and navigate. Similarly, all parents reported that the program content was relevant, if not to them directly then potentially to other families. In other words, parents recognized that, in the context of a universal parenting program, not all program material may be relatable to their family, and this situation is okay. The health-promotion content is a case in point. While this aspect was viewed as being an essential part of the program, some parents felt they were already using the program's health-promotion strategies, so this content was less relevant.

With and without prompting, several parents made suggestions for additional program content. Parents without a military background tended to provide broader suggestions (e.g. reading with your child, managing screen time use), whereas military parents focused on the insertion of content that specifically pertains to military family life (e.g. coping with parental absences). While many parents expressed appreciation for the interactive program elements, engagement in this content appears to vary according to its perceived relevance (e.g. PDF downloadables viewed only when regarded as personally relevant) and relatability (e.g. real-life authenticity of video clips). Example quotes regarding program acceptability and appropriateness are located in Table III.

Website usability

In all 22 program completers provided feedback on the website's usability. The vast majority (91 percent) indicated their overall experience using the website was "good" or "very good." In total, 96 percent stated they were "likely" or "very likely" to participate in another parenting program using the website. When asked if they found anything about the website confusing, 83 percent said no. For those who said yes to this question, the primary issue was site navigation being too complicated. As one participant commented, "The login, directed to the start page, directed to the lessons is way too cumbersome."

Participants were also asked about what could be done to improve their experience with the website. While a few (21 percent) suggested no improvements were necessary, most listed at least one improvement that could be made. Suggested improvements were grouped into one of three categories: website access and functionality (reported by 36 percent), site navigation and organizational structure (reported by 29 percent) and content (reported by 14 percent). Several parents who participated in an interview also spoke to website access and functionality and site navigation and organizational structure issues. Example quotes from this subtheme can be found in Table III.

Table III Acceptability, appropriateness and areas for website improvement: example quotes from parents

Themes	*Subthemes*	*Example quotes*	*No. of comments on this theme/subtheme*
Program satisfaction			22
	Overall satisfaction	"I really enjoyed it [the Grow Online program]. It seemed well thought out. The individual modules [. . .] the individual units seemed to be well prepared, a lot of work went into it. Initially I had some trouble accessing, getting into the website, but that cleared up, and I was able to just to get through and work on each unit. It worked out really well." – Mother, completer	18
	Satisfaction with website	"I thought it [the website] was very easy to use. I had no complaints. There was one session in which I was having technical difficulties. It wasn't loading and I think quite honestly what it ended up being was I restarted my Mac and the next day I tried it again and it picked up right where I left off." – Mother, completer	4
Relevance of content			33
	General relevance	"I think the content was really useful. It was super practical a lot of times [. . .] I liked the attachment or whatever they were at the bottom [of the webpage] with the different kind of cheat cards or whatever." – Father, completer "And some of the scenarios, you know, that are like they're playing with blocks on the floor or whatever it is [. . .] My younger of the two is five and a half. She's not doing that [. . .] However, like I said, some of the lessons towards the end, I was like, 'Man this is good stuff. Like, this is where I need to be.'" – Mother, completer	15
	Interactive program elements	"I liked the interactive activities. Those to me were the best part [. . .] the videos are kind of silly. The information is there, the scenarios are there, but, I had to giggle through some of the videos because I just felt like it was such forced acting [. . .]" – Mother, completer	7
	Health promotion content	"Yeah, again [i.e. content that is confusing or less relevant] I think it's the health portion. We try and incorporate that in terms of activities and limit some screen time. Well, we try to incorporate them. We're not always successful. So, that maybe wasn't as relevant, like you said, to our particular family. However, with the diverse target [. . .] the diverse audience that you're gearing this towards, I think that all the content would be relevant to at least someone out there." – Mother, completer	4
	Missing content	"[. . .] how do you communicate to your kid [. . .] [how do you] explain why dad's not home. Or [. . .] [that] you were planning on going on vacation, everything was set, and then orders came down and dad's going on a training. And I'm sure there's plenty of scenarios where it's not a military family and dad has a meeting that's a million-dollar negotiation and can't come home." – Mother, completer "You know the other topic that comes up to me, too, is the constant moderation of and understanding of how much or how little [. . .] My kids don't do much TV or phone or iPad right now, but it's increasing. And it's like a lot of the kids around already have phones and so like, when and how do we integrate that? [. . .]" – Mother, non-completer	4
	Military content	"I think a lot of these topics are, by and large, the same. Or, they really should be. I don't know many things that change. I mean [. . .] you know, parenting doesn't change a tonne. It's just the difference between doing it by yourself or doing it with a buddy." – Mother, non-completer	3
Website improvement			11
	Website access and functionality	"Not all the videos would load and some of the fill in the text boxes would allow me to type but when I'd submit, my writing would erase." – Mother, completer "Overall it was pretty good. The activities where you had to drag and drop an answer didn't always work properly. I found myself getting frustrated. Maybe need to redo that area." – Mother, completer	5
	Site navigation and organizational structure	"When going back to an unfinished module, have the ability to go directly to the page where you left off rather than going through the entire module again." – Mother, completer "Keep it simple. Log in and have it go right to the activities." – Mother, completer	4

Short-term program impacts

Table IV displays the results of the Wilcoxon signed-rank tests that explored the program's short-term impact on relevant psychosocial and behavioral outcomes. Statistically significant differences, all in the theoretically expected direction, were found for 9 of the 19 outcomes when using an α level of 0.05. Results suggested the program had an impact on outcomes related to each of its learning domains, though the fewest effects (i.e. two) were found for health promotion. However, when using the Bonferroni adjusted α level of 0.003 (i.e. 0.05/19), only the decrease in parents' use of rewards to encourage eating was statistically significant. Effect sizes (i.e. *r*) for all statistically significant outcomes ranged in absolute magnitude from 0.32 to 0.47, which are all in the medium range using Cohen's (1988) cut-offs.

Discussion

As discussed above, DD-PFIs are one mechanism for bringing evidence-based parenting advice to online platforms. The current state of the evidence suggests that such programs are feasible and effective (e.g. Breitenstein *et al.*, 2014; MacDonnell and Prinz, 2017). Less is known, however, about universal DD-PFIs that are intended for the general parenting population, especially programs that incorporate health-promotion content. This paper preliminarily addresses this gap by presenting the results of a feasibility and proof-of-concept study on the Grow Online parenting program. Though preliminary and limited by sample size and study design, the results are promising.

With minimal effort and over a short period of time, 83 individuals were recruited to participate in the program via word-of-mouth and social media postings. This suggests program recruitment is feasible, and it signals a potential advantage that DD-PFIs may have over PFIs delivered F2F. That is, DD-PFIs may experience easier recruitment than F2F PFIs (Czymoniewicz-Klippel *et al.*, 2019). This proposition certainly resonates with the hypothesis that DD-PFIs have the potential for greater reach than F2F PFIs. The study's recruitment strategies were easy to implement, and the registration process placed minimal burden on

Table IV Descriptive statistics and results of Wilcoxon signed-rank tests for program outcomes

Outcome	*Mdn (range)* T1	T2	*z*	*r*
Inconsistent discipline	2.33 (1.00–3.33)	2.33 (1.00–3.00)	−0.69	−0.10
Over-reactive discipline	3.20 (2.40–5.60)	3.00 (1.00–4.20)	−2.49*	−0.38
Internalizing behavior	3.50 (0.00–11.00)	2.00 (0.00–8.00)	−2.52*	−0.38
Externalizing behavior	6.00 (0.00–12.00)	3.00 (0.00–9.00)	−2.92**	−0.44
Prosocial behavior	10.00 (5.00–10.00)	9.00 (5.00–10.00)	0.88	0.13
Parenting stress	2.07 (1.00–3.86)	1.93 (1.00–3.57)	−1.37	−0.21
Parental efficacy	4.17 (2.67–4.89)	4.39 (3.67–4.89)	2.33*	0.35
Primary control	3.86 (2.86–5.00)	4.43 (3.14–5.00)	2.33*	0.35
Cognitive restructuring	3.20 (2.00–5.00)	4.10 (1.80–5.00)	2.52*	0.38
Emotion coaching	3.57 (2.43–4.71)	3.57 (2.57–4.71)	2.11*	0.32
Rewarding behavior with food	2.25 (1.00 3.00)	1.88 (1.00–3.25)	−1.56	−0.24
Rewarding eating	2.50 (1.00–3.50)	2.00 (1.00–3.17)	−3.11**,***	−0.47
Supporting physical activity	3.00 (1.60–4.00)	3.00 (1.40–4.00)	2.23*	0.34
Fruit consumption	3.00 (2.00–5.00)	3.50 (2.00–5.00)	1.31	0.20
Vegetable consumption	3.00 (1.00–4.00)	3.00 (2.00–5.00)	1.39	0.21
Sugar sweetened beverage consumption	2.00 (1.00–4.00)	2.00 (1.00–3.00)	−1.89	−0.28
Physical activity	4.00 (3.00–5.00)	4.00 (3.00–5.00)	1.39	0.21
Weekday screen time	3.00 (1.00–5.00)	3.00 (1.00–5.00)	−0.91	0.14
Weekend screen time	3.00 (1.00–5.00)	3.00 (1.00–5.00)	−0.27	0.04

Notes: $n = 22$. *$p < 0.05$; **$p < 0.01$. ***Significant at Bonferroni corrected *p*-value of 0.003

the participants. They simply visited the program's website, completed a brief online registration form and waited for log-in credentials to be e-mailed to them. The social media recruitment posts simplified this process even further by embedding the website link within the posts. Online recruitment strategies have been identified as effective and efficient in reaching intervention target audiences (Laws *et al.*, 2016).

This study was not, however, designed to examine the effectiveness of recruitment strategies for DD-PFIs or identify which barrier reduction aspects of such programming contribute to recruitment numbers. Thus, the authors are unable to determine which of the two recruitment strategies produced more registrants or what about the recruitment process (or program) contributed to the favorable recruitment numbers obtained. Since this study, an item has been added to the online registration survey that asks participants to indicate how they heard about the program. The resulting information will allow for a better understanding of which recruitment strategies are most effective at reaching participants.

Program engagement proved to be more challenging than recruitment. Over the course of the study, 73.5 percent of participants attrited. The high attrition rate was unfortunate, but participant retention has been identified as a challenge for DD-PFIs (Baumel *et al.*, 2017; Breitenstein *et al.*, 2014; MacDonnell and Prinz, 2017). No demographic or baseline differences were found between completers and non-completers, which suggests known participant characteristics did not influence the retention rate. Among those who finished at least one session, the only significant difference found was for time between program start and Session 1 completion. Non-completers took almost three times as long as completers to finish the first session. This finding suggests there may be a critical window at the beginning of a program that, if capitalized on, could help to increase retention rates. This claim should be tested in a more rigorous study; however, steps have been taken to motivate Grow Online participants to complete the first session as quickly as possible. For example, motivational e-mail reminders have been drafted and will be sent to participants periodically over the first week to encourage them to complete the first session.

Program completers' usage patterns indicated that participants did not generally follow the recommended pace of completing one session a week. Though summary statistics suggested this was the frequency with which users finished sessions, a more nuanced examination revealed participants' time between sessions followed a curvilinear trajectory. In other words, time increased over the first five sessions and then decreased markedly. Furthermore, almost three-fourths of program completers finished multiple sessions at one time at least once. Collectively, these data speak to a larger issue within the DD-PFI literature that focuses on how much control participants are given over how they can use the program. DD-PFIs are often described as self-paced programs that participants can complete at their leisure (e.g. Baker *et al.*, 2017), but studies typically place constraints on how participants can navigate through the program, such as locking down module access or limiting the length of time participants have access to the materials. It is unclear how such strategies impact engagement and program outcomes. On the one hand, such constraints could result in a misrepresentation of how participants would use the program in their absence. For example, the curvilinear trajectory for session completion may have been the result of limiting participants' access time to the program. Perhaps if a study end time had not been introduced, a linear trend would have been found. On the other hand, imposing constraints could serve to ensure participants are exposed to material in a theoretically meaningful way, and they are given time to consolidate learning and practice skills. In fact, the primary concern related to the finding that so many participants completed sessions concurrently is that they may not have taken the time to practice session skills with their children. Certainly, more research on the topic of user control is needed to help make more informed design decisions. At this early stage of development and implementation of Grow Online, there is insufficient information to make a knowledgeable decision regarding the level of appropriate user control for the program. Thus, it was decided to continue to have

users proceed through the program in a linear fashion with subsequent session access being locked until the prior session is completed. Future work on the program will investigate what effect varying levels of user control have on implementation (e.g. program completion) and program (e.g. parenting behaviors) outcomes. Following this study, the session reflects were modified to incorporate a critical reflection framework (Rolfe *et al.*, 2001) that intended to deepen participants' thinking about what they learned in order to help counteract the lack of skill practice that might be occurring between sessions.

Program completers' engagement with the interactive elements of the program (e.g. reflects and quizzes) across all sessions was quite high based on summary statistics. There were instances in which engagement with these program elements was low for some users; however, across all sessions, at least 80 percent of the participants engaged with 75 percent or more of these components. Participant self-report data also suggested high engagement with the program sessions. Furthermore, quantitative and qualitative results suggested program completers found Grow Online acceptable and appropriate. In addition to global satisfaction, program completers and interviewees indicated they were satisfied with the various features of the program, such as the videos, the interactive activities and the Parent Toolbox. The majority of program completers rated their experiences using the website as "good" or "very good," and over three-fourths indicated they found nothing about the website confusing. Overall, the results strongly support the feasibility of Grow Online.

Participant feedback also indicated multiple aspects of the program that could be improved. For example, one participant commented in her interview that, at times, the videos seemed silly because the acting was forced. She also stated that despite this, the scenarios and the information conveyed were relevant. As another example, several participants indicated a desire for the program to cover additional parenting situations, such as how to help a child cope with disappointing circumstances and how to navigate a child's desire for technological devices. Four participants specifically mentioned issues with site navigation or organizational structure, such as simplifying the log-in process and allowing users to more easily access their responses to the prior session's interact when completing the next session's reflect.

All feedback received was reviewed by the research team to identify program improvements. Full consideration was given to those adjustments that were deemed feasible. For example, due to financial and logistical reasons, changes to the video scenarios could not be made. However, it was determined that additional, stand-alone modules that used less intensive media formats (e.g. whiteboard animation) could be developed to address additional topic areas not covered by the main program. These modules have been labeled "Digging Deeper." The changes put in place since this study was conducted intend to enhance users' experiences with the program.

In addition to the positive feasibility findings, proof of concept for the program was demonstrated by the promising short-term effects on key program outcomes. Statistically significant (i.e. $p < 0.05$) within-group changes were found on variables that align with each of the program's primary learning domains (i.e. positive parenting, stress management and health promotion). In particular, parents' use of over-reactive discipline and rewards to encourage eating and child externalizing and internalizing behaviors decreased. Parental efficacy, emotion coaching, encouragement of healthy child coping strategies and support of child physical activity increased. Effect sizes were medium in magnitude based on conventional standards (Cohen, 1988), which suggests the program may have had a modest impact on improving these outcomes.

Though promising preliminary effects were found, a number of non-significant effects were also present. No changes were found for parental stress, inconsistent discipline or using food as a behavioral reward. Furthermore, no differences were detected for child prosocial

behaviors or healthy lifestyle behaviors. Moreover, when a Bonferroni correction was utilized to compensate for the multiple tests that were conducted, eight of the nine previously mentioned statistically significant effects were no longer considered significant. Bonferroni corrections, however, reduce statistical power and increase the likelihood of committing a Type II error (Field, 2013). Given the reductions in statistical power due to the small analytic sample size and the use of non-parametric tests, the results based on the Bonferroni adjustment may be overly conservative.

At the conventional α level of 0.05, the majority of the null effects were in the domain of health promotion. This could be reflective of inadequate measures. For example, items from the HHQ were used to assess healthy lifestyle behaviors. These items align well with the program's health-promotion content, but no validation studies have been performed. Thus, while the items may have face validity, they may lack other measurement properties that would make them useful for assessing change. In addition, the health promotion measures (as with all measures used in this study) were not originally developed for online administration, and transposing them from a paper-and-pencil to online format could affect validity or sensitivity to change.

An alternative explanation for the limited health-promotion effects could be that the current participants find this aspect of the program to be less relevant. During the interviews, several program completers commented that they were already supporting their child's healthy lifestyle as recommended by the program. As can be seen in Table IV, baseline scores on these items suggest participants' children were generally doing well on these behaviors. The only exception to this was fruit and vegetable consumption where the scores suggested children were getting fewer servings a day than is recommended. It has been suggested that parents participating in PFIs tend to be more interested in topics related to general parenting than health promotion (Haines *et al.*, 2012). Still, improvement was found on measures of parental support of physical activity and use of rewards to encourage eating. This suggests that, even if parents do not perceive health promotion to be a primary concern for them or their child, benefit can still be derived by participating in a program that includes such content.

Limitations

This study had several limitations. First, the study design did not include a comparison group, so it is not possible to make definitive causal statements about the program's impact on participant outcomes. Second, the attrition rate was very high, although differential attrition analyses did not reveal any significant demographic or baseline differences. Furthermore, the high attrition rate resulted in analyses being performed with a small sample size. This limits statistical power, and it also calls into question the generalizability of the results, especially considering the majority of the analyses were done using program completers' data. Non-completers were solicited for the interviews, but only three agreed to participate. Third, the sample consisted mainly of white, college educated women over the age of 34. This homogenous sample also limits the generalizability of the findings. Fourth, all outcomes were measured through self-report methods, which can be influenced by biases, such as social desirability effects or common method variance. Fifth, three measures (i.e. the SDQ internalizing subscale, the PLOC parental efficacy subscale and the MESQ emotion coaching subscale) were found to have low internal consistency (i.e. < 0.70) at pre- or post-test, and as such, results based on these measures should be interpreted cautiously. Given prior work showing these measures to be psychometrically sound, it is unclear why Cronbach's α estimates were low. Perhaps the online administration of the measures had some effect on these estimates, as the measures were originally developed and tested using a paper-and-pencil format. However, several studies have shown that psychosocial, behavioral and health-related measures have equivalent psychometric properties when administered online or via paper-and-pencil (Brock *et al.*, 2012; Ritter *et al.*,

2004; Weigold *et al.*, 2013); thus, other explanations are potentially more plausible. For example, Cronbach's α is a point estimate, and like all point estimates, it is subject to sampling error (Bonett and Wright, 2015); thus, our small analytic sample, which is likely not representative and has limited statistical power, could be the cause of the low reliability estimates. Sixth, limitations in the LMS precluded the research team from gathering certain types of meta-data (e.g. number of log-ins, number of page views and log-in length) that have been recommended to be collected and reported to better understand DD-PFI feasibility and effectiveness (Breitenstein *et al.*, 2017). Finally, no follow-up was conducted, so it is unknown if the effects were maintained over time.

Conclusions

Despite these limitations, these findings support the Grow Online program's feasibility and demonstrate proof of concept. This is an important first step for novel programs in order to determine if more rigorous and costly research is warranted (Czajkowski *et al.*, 2015). Following Czajkowski *et al.*'s (2015) recommendations, a pilot study utilizing a more rigorous research design that includes a comparison group will be conducted. This study will provide greater insight into the program's effectiveness. Given the issues that were experienced in the present study with attrition, this follow-up study will also continue to investigate the program's feasibility. Particular attention will be paid to determining predictors of program completion to help identify program aspects that can be modified to help support and motivate participants as they go through the program. This type of analysis will also help to illuminate and clarify participant characteristics that explain retention and, in the end, will help the parenting field continue to refine its understanding of who is best served by DD-PFIs.

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