Developing the Technology-based Parenting Young Children Check-Up Intervention for Disruptive
Behavioral Problems in Early Childhood

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Abstract

Behavioral parent training programs show clear efficacy/effectiveness in response to young children's disruptive behavior problems, but limitations in engagement and accessibility prevent many families from benefiting from these programs. The Parenting Young Children Check-up (PYCC) is a technology-based program being created to overcome these barriers and increase the reach of behavioral parent training. Developed for use in pediatric healthcare settings, the PYCC includes three parts: 1) an initial check-up designed to motivate program involvement; 2) text messages; and 3) a parent training website involving interactive video-based content to teach parenting skills. Following an established intervention development framework, this report details initial steps to refine PYCC intervention materials. Seventeen mothers and 17 primary care physicians (pediatricians or family medicine physicians) participated in this mixed methods data collection across three iterations. During semi-structured interviews, participants provided feedback regarding early drafts of the three parts of the PYCC; participants also completed a feedback questionnaire. Refinements were made to the PYCC materials after iterations 1 and 2. A third iteration of data collection revealed saturation of qualitative input, positive qualitative feedback, and positive quantitative ratings on the feedback questionnaire. This project represents an example of using mixed method input to refine and create a technology-based, behavioral intervention. Project completion led to a full version of the PYCC, which will be tested in a proof-of-concept trial and a subsequent pilot randomized clinical trial.

Key words: Disruptive behavior problems, behavioral parent training, technology-based interventions, intervention development, mixed methods

Developing the Technology-based Parenting Young Children Check-Up Intervention for Disruptive Behavioral Problems in Early Childhood

Disruptive behavior problems (DBPs) are a substantial and under-treated public health threat. Disruptive behavior disorders in young children are highly prevalent, with Oppositional Defiant Disorder (ODD) and Attention Deficit Hyperactivity Disorder (ADHD) each affecting over 10% of preschool-aged children (Lavigne et al., 2009). Such disorders can persist into adolescence (Thompson et al., 2011), raising the likelihood of negative outcomes such as substance use (Moffit, Caspi, Dickson, Silva, & Stanton, 1996). Behavioral parent training (BPT) programs, which are typically provided as face-to-face programs that teach parenting skills to reduce DBPs, show clear efficacy in treating young children (Eyberg et al., 2001; Reid, Webster-Stratton & Hammond, 2003). Unfortunately, only 3% of young children with an emotional/behavioral disorder receive any treatment at all (Lavigne et al., 2009), and of families that begin a BPT program, approximately half drop out early (Beveridge et al., 2015). Proactive intervention approaches that aim to expand the reach of BPT are clearly needed.

Technology has shown promise as a high-reach and accessible method for delivery of evidence-based content in areas such as substance use (e.g. Przybylko et al., 2021), and research suggests that online BPTs for parents may be efficacious (Sanders, Baker, & Turner, 2012). However, online BPT programs to date have not developed an approach to proactively engage parents in participation. This investigation sought to create a three-part technology-based program, the Parenting Young Children Check-up (PYCC), with the goal of engaging parents in program use in a setting they already use regularly (i.e., Pediatric primary care). We refined the program using mixed-method+ input from parents as well as from primary care physicians and used that feedback to create a full version of the PYCC.

Barriers to Traditional Parent Training and Possible Solutions

As reviewed by McGoron and Ondersma (2015), parents face many barriers in connecting with BPT. For example, there is a well-recognized shortage of mental health services for children (Cummings, Wen, & Druss, 2013), waitlists are common (Werba et al., 2006), and many parents do not know where to

find help (Pavulri, Luk, & McGee, 1996). Further, many families faced with DBPs do not recognize there is a problem or are uninterested in engaging in in-person services requiring an extended commitment and self-identification as someone in need of assistance (Girio-Herrera, Owens, & Langberg, 2012; McGoron & Ondersma, 2015; Pavulri et al., 1996). Other parents adopt a “wait and see” approach and defer seeking help (Girio-Herrera et al., 2012). Innovative BPT programs must be created with these barriers in mind.

Emerging research suggests at least three potential approaches to overcoming these barriers. First, delivering BPT through pediatric primary care may significantly enhance its reach. The vast majority of children in the U.S. receive regular health care from a doctor’s office (Bloom, Jones, & Freeman, 2013), and current guidelines encourage incorporating mental health screening into *every* pediatric healthcare visit (Wyckoff, 2021). Pediatric delivery of behavioral health interventions is also ideal for young children as there are well-child visits at ages 2, 2 ½, 3, 4, and 5 years old (Hagan, Shaw, & Duncan, 2007). Notably, self-administered BPT in healthcare settings (i.e., giving parents packets outlining evidence-based parenting skills) shows promise for responding to elevated DBPs in young children (Berkovtis et al., 2010). Second, the efficacy of motivational approaches as a precursor to more intensive treatments has shown promise in other areas (e.g., Muir, Constantino, Westra, & Antony, 2021) and may also be a way to facilitate engagement and retention in BPT programs. For example, Chaffin et al. (2009) found that use of a Motivational Interviewing session at the outset of a home visiting program reduced program dropout. Third, as with the distribution of packets noted above, technology may be an inexpensive and accessible way to share BPT content with parents. But unlike self-help materials, technology can allow interactivity, tailoring, use of multimedia and proactive reminders to help facilitate efficacy. Research in this area is encouraging; for example, online BPT programs such as Triple P Online have demonstrated reductions in parent-reports of DBPs (Sanders, Baker, & Turner, 2012). Further, smartphone ownership is becoming ubiquitous, even among low-income populations (e.g., McGoron, Hvizdos, Bocknek, Montgomery, and Ondersma, 2018)—allowing digital intervention developers to build sophisticated content that takes advantage of these devices’ capabilities.

The Parenting Young Children Check-up (PYCC)

The PYCC is designed to overcome barriers to traditional BPT in order to reach parents of young children (ages 2-5 years old) with DBPs by using motivational content, technology-based delivery, and initial engagement during pediatric primary care visits. It is designed to have three parts (see Figure 1): 1) the initial check-up, 2) text messages, and 3) parent training website. Parents go through the initial check-up while waiting at a pediatric visit and then enter their phone number to begin receiving text messages. The website teaches behavioral parenting skills through interactive modules with video-based content derived from common elements in evidence-based BPT programs and organized into two categories: *preventing* and *responding* to children's challenging behavior (see Table 1). The program was created through the Computerized Intervention Authoring System (CIAS; Ondersma, Chase, Svikis, & Schuste, 2005), which is a platform that allows researchers without programming expertise to create sophisticated, technology-based interventions.

PYCC development is guided by the ORBIT model for behavior intervention development (Obesity-Related Behavioral Intervention Trials; Czajkowski et al., 2015). The ORBIT model moves through steps from basic research to phase 3 efficacy trials. There are four phases, but there is also flexibility to return to earlier phases as needed. Phase 1 includes *defining* and *refining* the intervention and intervention materials. In the define step, a clinical question guiding intervention development is identified, and basic elements of the behavioral intervention are defined. We identified the need for increased reach of BPT through a review of relevant literature (see McGoron & Ondersma, 2015a) and identified promising elements of interventions that could accomplish this goal. Next, we collected surveys from parents and pediatricians to determine initial feasibility of this approach (McGoron & Ondersma, 2015b). We found many parents were already using pediatric settings to get information about children's behavior. Parents and physicians were open to using tablets as part of pediatric visits to get information about children's behavior and parenting. Additionally, parents were open to using a parent training website, and pediatricians were open to referring parents to a parent training website. Next, we created

beta intervention materials with the goal of refining the intervention based on end users' (i.e., parents' and physicians') input. In the present investigation, we report results of gathering mixed methods data (i.e., qualitative interview and survey results) to create a full version of the PYCC.

Project Goals

Following the ORBIT model, we sought to refine and create program materials for the PYCC through the collection of mixed methods data from end users (i.e., parents and pediatricians). Through an iterative process, we sought to continue data collection until we:

1. Made all feasible modifications to the intervention content, as suggested by end users.
2. Received positive qualitative feedback that evidenced end users had a positive perception of the program.
3. Received positive quantitative ratings of the program from end users (i.e., on average, receiving "agreement" with positively worded items about elements of the program). In line with the Technology Acceptance Model (Davis, Bagozzi, & Warshaw, 1989), we sought to have high ratings of perceived usefulness and ease of use.

Method

Participants

Participants included 17 mothers of children ages 2-5 years old with elevated BBP and 17 physicians (pediatricians and family medicine physicians) from 5 different practices. We aimed to have approximately 5 parents and 5 physicians in each iteration of data collection as literature on technology development suggests 5 users is generally sufficient for early testing (Turner, Lewis, & Nielsen, 2006). There were three iterations of data collection: Iteration 1 included 5 parents and 6 physicians, Iteration 2 included 7 parents and 6 physicians, and iteration 3 included 5 parents and 5 physicians.

Recruitment

Physicians. Primary care physicians were recruited from pediatric and family medicine clinics, beginning with recruitment emails sent to department chairs of several of departments affiliated with universities or large health care systems. These department chairs forwarded the email to staff physicians. All physicians were from one geographic area in the Midwest. Interested physicians contacted the PI to schedule a time and place to participate. Most data collection took place in private rooms or offices in physicians' clinics, but some physicians elected to meet in a quiet area like a coffee shop.

Parents. Parents were recruited at pick-up and drop-off times at childcare centers in a large Midwestern city or through a university-based participant registry of parents of young children. Interested parents were asked to complete a screener that included demographic items and the Strengths and Difficulties Questionnaires (SDQ; Goodman & Goodman, 2009) to screen for disruptive behavior problems and determine eligibility. The SDQ has scales for child conduct problems and hyperactivity in children and yields four-band categories for scores including “*close to average*,” “*slightly raised*,” “*high*,” and “*very high*.” Parents were eligible if their child's score was in the “*high*” category on either scale, but we were also careful to include some participants who scored in the “*very high*” category to ensure representation across the DPBs spectrum. Exclusion criteria included the child having a diagnosis of autism spectrum disorder or an intellectual disability, or the child currently receiving treatment for ADHD or ODD. Parents were compensated with a \$5 gift card for completing the screener.

The screener was completed by 160 parents; 35 were eligible for participation, and 17 went on to participate. Most data collection was scheduled to take place at the parent's home, but some elected to meet at a public location such as a coffee shop. Interviews occurred at a time convenient for parents.

Procedures.

Qualitative Agenda. A qualitative agenda was prepared prior to the beginning of data collection to guide the semi-structured interviews. Separate versions of the agenda were created for parent

interviews and physician interviews, but there were overlapping items and the overall structure and goals were the same for both. Scripts within the agendas guided interviewers in introducing participants to the interview, giving an overview of the PYCC, and introducing sample content for the brief intervention, text messages, and parent training website. In each part of the interview, there were probe questions. For instance, after the participants saw an example video from the parent training website (i.e., about giving a child a timeout) one probe was “*tell me what you think about the video*” and follow-up questions were “*what do you like about it?*” and “*what do you not like about it?*”

Data Collection. In-person study visits began with participants being consented. Then, following some rapport-building conversation, participants were given an overview of the PYCC and shown beta materials (see Figure 1). Interviews were conducted by the PI (1st author) and a research assistant (5th author). Parents were asked to comment on 1) the initial check-up, 2) text messages, and 3) the parent training website. Both parents and physicians were given an overview of the PYCC program and then went through example content. Specifically, participants went through a segment of the initial check-up (including getting feedback from the animated narrator about child’s behavior and seeing a video of an actress presenting as a teacher talking about challenging child behavior), saw a sheet of example text messages, saw an example video from the parent training website (specifically one teaching a timeout procedure), and saw a list of skills that we planned to teach through the parent training website (see Table 1). The interviewer was guided by the qualitative agenda in asking questions and following up on the participant’s response (e.g., “*tell me more about that...*”). In line with being a semi-structured interview, the discussion was casual with a focus on building and maintaining rapport. All interviews were audio recorded. At the end of the interview, all participants completed a brief survey in which they rated their perception of each part (i.e., initial check-up, text messages, and parent training website) of the PYCC program. Data collection took approximately one hour. Participants were compensated with gift cards for their time. Data collection continued until there was agreement that a point of saturation was reached. That is, based on discussions with the project team, we agreed that additional data collection would not

lead to meaningful improvements in the program as the program was highly rated and suggestions had reached a point where they were repetitions of things that we could not address (i.e., refinements beyond the scope of this project) or minor in nature (e.g., preferences about appearance).

Coding Qualitative Interviews. We used the Framework Method (Gale, Heath, Cameron, Rashid, & Redwood, 2013) to code the qualitative interviews. This process included six steps. **In step 1**, recorded interviews were transcribed. This was done by two research assistants. **In step 2**, coders familiarized themselves with the transcripts to get an overall picture of the results before extracting and coding specific quotes. At this stage, the project team noted any important thoughts or impressions that were emerging from the transcripts. In this deductive investigation, we also used the qualitative agenda prepared for this project to begin outlining the coding manual. **Step 3** included initial coding in which the coding team went over each transcript line-by-line and applied preliminary codes to them. Two members of the research team (i.e., the PI [first author] and a lead research assistant [5th author]) independently reviewed and double-coded several printed transcripts and noted codes for specific passages in the margins. **In step 4**, developing a working analytic framework, researchers met to discuss initial coding results, refine the coding manual, and condense or group codes into categories. For the present investigation, several repetitions of coding and refining, involving additional research assistants (i.e., 6th and 7th author) took place to arrive at the final coding manual. **Step 5** involved coding all transcripts using the finalized categories and codes. Three research assistants (i.e., authors 6, 7, and an additional student assistant) completed the final coding for the project across each iteration. All interviews were double coded with input from the PI (1st author) as needed. Each category and code was noted by a number that the coder assigned to specific text. **Finally, in step 6**, coded quotes from the transcripts were charted into the framework matrix. In this project, a spreadsheet was created to chart the coded interviews. One spreadsheet was used for parents and another for physicians. This procedure led to easy-to-read documents that clearly highlighted areas of strengths and needs for improvements in PYCC materials. The spreadsheet also allowed for documenting the frequencies of each specific category/code in each

iteration. Results of this coding process were discussed among team members to guide decisions about changes to the PYCC following each iteration of data collection. Training coders was an ongoing process, led by the 1st author, that included reading the coding manual together, going over example codes, completing coding together, and doing practice coding assignments and reviewing discrepancies. Regular meetings took place to discuss the coding process, answer questions, and resolve discrepancies.

Measures

Demographics. Parents reported their age, race, gender, and highest level of education. Physicians reported their current position (resident, attending, or fellow), number of years they have been practicing medicine, number of years practicing primary care, their race, and gender.

Final Categories and Codes. The final coding system included categories for participant comments specific to 1) the initial check-up, 2) text messages, 3) parent training website, and 4) overall program. Within each category, codes captured statements that noted a) something positive, b) a suggestion for specific change, or c) a criticism/concern. For each category, there were also additional codes specific to that aspect of the program. For instance, we noted that many parents said that they already used the strategies taught in the parent training website, so we created a code specific to such statements. See Table 2 for a description of codes used in this investigation; the full coding system is available on Open Science Foundation (OSF; <https://osf.io/z9jbt/>). We report here examples of extracted quotes for each category/code and the frequency of each category/code across the three iterations.

Survey. Physicians and parents filled out a paper feedback survey after completing the semi-structured interview. The survey was created for this project and guided by the Technology Acceptance Model (Davis et al., 1989) with items tapping into participants' perceptions of ease of use, usefulness, and attitude toward using the PYCC. Four items assessed each component of the PYCC (initial check-up, text messages, and parent training website). Wording of items varied for physician and parent participants (specific items are reported in Tables 2 and 3). Items were rated as “*definitely disagree*,” (0), “*disagree*,”

(1), “*unsure*,” (2), “*agree*” (3), and “*definitely agree*” (4). We report here the mean, standard deviation, and range of responses for each item. Additionally, a “total component” score was computed for each part of the program (e.g., mean of all ratings for each part of the intervention) and a “program total” score (i.e., mean of all survey items inclusive of ratings for all parts of the intervention) was computed.

Results

Participants

Parents. All participating parents were mothers. Fifteen were Black/African American (94.17%), 1 (5.88%) was White, and 1 (5.88%) selected “other” for race; this racial make-up closely matches the city in which data collection took place. All parents reported that the child of focus (i.e., children ages 2-5) for this investigation had elevated DBPs; 10 children (58.8%) were boys. On average, parents were 32.1 years old ($SD = 5.7$). Three parents (17.6%) reported not completing high school, 5 (29.4%) received a high school diploma or GED, 3 (17.6%) completed some college, 1 (5.9%) reported having an Associate’s degree, 1 (5.9%) reported having a Master’s degree, and 4 (23.5%) mothers did not provide information about education. Six (35.3%) mothers were never married, 2 (11.8%) reported being unmarried but living with a romantic partner, 3 (17.7%) were married, and 5 (29.4%) did not provide this information.

Physicians. Physicians ($n = 17$) were pediatricians or family medicine doctors. Fifteen physicians reported they were attendings and 2 were residents. Physicians had, on average, 12.3 ($SD = 11.2$) years of experience in primary care. Most physician participants were female ($n = 16$, 94.1%). Physician-reported race was: 7 (41.2%) White, 4 (23.5%) Black/African American, 3 (17.6%) Middle Eastern, 2 (11.8%) Asian, and 1 chose not to answer (5.9%).

Iteration 1

Five parents and six physicians participated in the first iteration of data collection. A full list of extracted quotes can be found at OSF (<https://osf.io/z9jbt/>) for all iterations. We present here example quotes that were key in refining/developing the PYCC program and participants’ ratings of the program.

Initial Check-up. Parents made 14 **positive/benefit** comments about the initial check-up. One parent commented, *“I just think it’s cool because you get to know more about your child, and it’s better to know before getting seen anyway so.”* Parents did not make any **specific suggestions** but made 2 comments coded as **concern/criticism**, both of which were about the animated narrator (e.g., *“...but like he looked like his sound, his voice is, is dragging though”*). Physicians also made 14 **positive/benefit** comments. For example, *“I like that he [animated narrator] reads off the question.”* Physicians also had made 6 **specific suggestions** and 15 **concern/criticism** comments. Many of these comments were about the graph in the brief intervention. For instance, *“Um I think the graph may be a little hard to understand....”* Some comments were also about the animated narrator (for example, *“I worry about being too cartoony with adults, you know, um depending on their level of, uh but you know”*). One physician commented that she cannot see the initial check-up being part of visits at her clinic (i.e., *“I don’t think this should be actually part of the visit at all”*). Another physician expressed concern about use of technology in low-income families (i.e., *“It’s also kind of you know, concerning, if you are dealing with kind of low socioeconomic families... how much access they have....”*). In terms of survey ratings, parents rated the initial check-up highly, but physicians’ ratings averaged below 3 (i.e., “Agree,” see Tables 3 and 4).

Text Messages. Six **positive/benefit comments** were coded for both parents and physicians. For instance, a parent noted, *“I think that’s a very, very, good idea, because you can do that anywhere”*. One physician commented, *“with parents in this age group, I think no one talks to anybody, so texting, is perfect.”* Parents had no **specific suggestions** or **concern/criticism** comments. One **specific suggestion**, was coded for physicians, which suggested making the texts more “interactive.” Five comments from physicians were coded as **concern/criticism**, including *“But the other thing is like that takes data.”* In terms of quantitative ratings, both parents and physicians rated the text messages highly (Tables 3 and 4).

Parent Training Website. Parents made 14 **positive/benefit** comments about the parent training website. For example, *“Yes, I thought, I think it’s [the timeout video] helpful because I don’t sit them in a*

chair, I tell them to get in the corner, yeah." Parents also had 2 **specific suggestions** including (in regards to the time out video), *"Make more, what, realistic."* Parents also made three comments coded as **criticism/concern**, including, *"Yeah, yeah, the setting [for time out video] was normal but the kid was just a little too happy, or too sneaky."* Physicians made 21 comments coded as **positive/benefit**. One physician commented, in reference to the list of topics on the website, *"I really like this actually, this is one of my favorites [special time], because I think parents forget that they should play with their children, and positive reinforcement I love too, effective commands, we all need to know how to do that....And routine is my biggest one, because families do not have routines, they do not understand."* Physicians also made 4 **specific suggestions** and 1 comment coded as **concern/criticism**. For example, *"... I think they should have had a kid screaming [in the time out video]. That would have been better."* In term of quantitative ratings, parents rated the website highly and physicians rated the parent training website lower (See Table 3 and 4).

Overall. Four comments from parents were coded as **positive/benefit** for the program overall (e.g., *"I will feel good about using it because it will help me learn about my children, maybe teach me something I don't know"*), and parents made no comments coded as **specific suggestion** or **criticism/concern**. Physicians made 9 **positive/benefit** comments (e.g., *"I really like it a lot because I think it's something that's not that hard to implement"*), 4 **specific suggestions** (e.g., *"No, I think it's more like, one deciding if you're going to do this for every child that comes in between two and five, or well-child visits because I think just clarify when and how often we're going to do it, starting with well-child is easier..."*) and 3 **criticism/concerns** (e.g., *"...if it like prolongs how long they're in the clinic then they're not going to want it..."*). Overall, in terms of quantitative ratings, parents rated the program highly, but physicians did not (see Tables 3 and 4); thus, in the first iteration of data collection, we did not reach our goal of achieving positive ratings from participants.

Changes Made to the Program. In response to this first iteration of data collection, we made several changes to the PYCC program. **First**, we changed the feedback chart in the initial check-up,

incorporating suggestions from physician participants (see Figure 2 for original and changed chart).

Second, we worked to revise the programming of the animated narrator in the initial check-up with the aim of increasing sound speed. **Third**, we changed the filmed example of the time out procedure to one where the child expressed being more upset and resistant.

Iteration 2

Seven parents and 6 physicians participated in the second iteration of data collection.

Initial Check-up. Parents made 10 **positive/benefits** comments, including *"Um it's [the animated narrator] cute,"* and *"I like that word 'strong-willed'."* Parents also made 7 **specific suggestions**, including *"Just let them read it... You don't have to have [the animated narrator]."* Parents made 9 comments coded as **criticism/concern**. These comments suggest negative reactions to the feedback chart: *"I didn't really like that they um compared my results with other parents' results,"* *"...the next question was 'do you agree that your child was in the red?' 'No.' Even though in my heart I know that my child is red I don't agree with you. If that makes sense, because that's just the d- like people automatically go into the defense. So that automatically made my defense [go up], my wall go up. So the way it's, I don't know,"* and *"It seems harsh, I would feel offended."* Physicians made 8 comments coded as **positive/benefit** including *"Oh...I thought it [the animated narrator] was cute."* Physicians made 9 comments coded as **specific suggestion** including *"...my only initial thought- I mean he [animated narrator] just sounds robotic...."* and *"So uh I mean if there was someone to make sure that they could get these things while they're in the waiting room it would work out completely..."* There were also 9 comments coded as **criticism/concern**, including *"I think it [the feedback chart] is judgmental. I mean I don't know how you can get around that."* On average, parents and physicians rated the initial check-up high (see Tables 3 and 4), but one parent gave all the initial check-up items a '1' (i.e., disagree). One parent and one physician had negative perceptions of the program (comments noted above) that needed to be addressed.

Text Messages. Parents made 14 comments coded as **positive/benefit**; for example, *“Interesting. I like it. Simple.....I would click on it.”* Four comments were coded as **specific suggestions**, for example *“I would suggest not um the extra ones, like mostly the ones that have the links to them.”* Parents did not make any comments coded as **criticism/concern**. Physicians made 11 comments coded as **positive/benefit**. One physician commented, *“Yeah, but also like I feel like these are good from what I’m reading, you know? It’s like kind of interactive, like you know, makes you think one way or the other, so.”* Physicians also made 2 **specific suggestions** and expressed 4 **concerns/criticisms** about the texts. One suggestion was *“I’d say make the sentences fuller and put more periods in it. So short complete sentences...”* Some **concerns/criticisms** centered on access to text messaging: *“....Our patients keep changing their phone numbers like so quickly. I don’t know why they do that, but they just do. So I feel like that might be a little bit of a challenge for our patients here,”* and *“Hopefully, they have free texting...”* Parents and physician rated the text messages highly (see Tables 2 and 3).

Parent Training Website. Parents made 27 comments coded as **positive/benefit**, including *“[in regard to timeout video] it was pretty good. I was engaged,”* and *“...it was never even explained to me that timeout is for the child to calm down. It’s not supposed to be a punishment...”* Ten parent comments were coded as **specific suggestions**, for example *“I would say more like add, like what to do if they, you know, would run off,”* and *“guess you could say use diversity of people.”* Four comments were coded as **criticism/concern**, including *“My, my only thing is that like when, okay. When you sit them down and you say ‘don’t get up’ I’ll have to be sitting down too because my son, he’s going to get up...”* Additionally, ten comments showed parents perceived they **already used the strategies** being taught; for example, *“So yep we definitely, definitely do timeout [laughs]”* Physicians made 30 comments coded as **positive/benefit**. Some examples include *“Uh what I like about it is that these are things that have worked and that it’s clear there’s evidence behind them, and that’s um and that it’s not the same way I would treat or teach a child that didn’t have disruptive behaviors....it’s very different,”* *“[regarding timeout video] It was very clear and it was very easy and easy enough to follow.”* There were 10 **specific**

suggestions made. Many of the suggestions focused on adding additional content to the program (e.g., *“how do you socialize them, how do you teach them to be kind, how do you teach them to say please and thank you, how do you teach them to wash their hands, how do you teach them to show respect for other people, this is controlling the outbursts, but I don’t see um the very specific instructions on how to help them integrate, or to be part of society,” “... so just more skills for responding to the disruptive behavior.”*). Two comments were coded as **criticism/concern** including *“Yeah I, I mean the example one didn’t seem too realistic.”* Parents and physicians rated the parent training website highly (see Tables 2 and 3).

Overall. About the program overall, parents made 25 **positive/benefit** comments, 1 **specific suggestion**, and 0 **criticism/concern** comments. Examples of positive/benefit comments include one parent noting *“I think what is nice about these videos is like I can go back and keep clicking on them, you know I wouldn’t want it to be like one time like click on this and its, it expires and you know...”* The specific suggestion coded was *“Just don’t... put anywhere or any word in of statistics.”* Physicians made 12 **positive/benefit** comments, 4 **specific suggestions**, and 2 **criticism/concern** comments. For example, a **positive/benefit** comment was *“I feel like it’s an exciting program and it’s a nice resource for us to have,”* and a **criticism/concern** comment was *“Yeah, I mean the timing would worry me, because I don’t think I would have all that time to go over everything and do that along with the other checklists we give them, plus another, so.”* In terms of **specific suggestions**, one physician remarked *“So it’d be nice to give a handout or like a resource that parents can use.”* In terms of quantitative ratings, both parents and physicians, on average, rated the program highly (see Tables 2 and 3), meeting the project goals. However, the negative comments about the initial check-up needed to be addressed, necessitating a third iteration of data collection.

Changes Made to the Program. **First**, given that both a parent and physician brought up concerns that the feedback chart was judgmental/offensive, we changed the feedback chart (see Figure 2). In the new version of the feedback chart, we used the word “strong willed” given that parents responded

positively to that term. **Additionally**, we increased diversity of people in the parent training content. We also filmed content for the parent training website with actors playing father and son. **Finally**, we continued to refine the wording and speed of the animated narrator in the initial check-up.

Iteration 3

Five parents and 5 physicians participated in the third iteration of data collection.

Initial check-up. Parents made 14 comments coded as **positive/benefit**, for example, *“and you can pause it, that’s good because my kids especially at a doctor’s office, those two, they are runners, they are runners,”* and *“It [the animated narrator] was helpful....”* There were 8 comments coded as **specific suggestions**. For example, *“Um, well if I take [child’s name] to my appointments, if I had someone else there, he can definitely help wrangle them up.”* Next, 7 comments were coded as **criticism/concern**, such as *“He’s [animated narrator] too robotic. I was just like he kind of makes me, don’t really listen.”* Physicians made 14 **positive/benefit** comments. *“Um I really liked the teacher [an actor in a video in the initial check-up]. I thought she was very warm and engaging,”* *“I like, you know, cutesy cartoon character is very pediatric.”* Physicians also made 9 comments coded as **specific suggestions** with some examples being *“You know, so don’t over-euphemize it [strong-willed] because there is a degree- degree to which this is disruptive and potentially harmful, and I think just putting it as ‘strong-willed’ is mixing too many things in.”* Additionally, physicians made 7 comments coded as **criticism/concern** like *“The [animated narrator] is a little monotone.”* One physician noted concerns about having the brief intervention as part of pediatric practices, stating, *“...it would be hard to get everyone [on board] to remember that we need to do it when it’s like okay only once a week or twice a week are we going to see a kid age two to five. It’ll be six months before everyone has gone through that process.”* Parents and physicians rated the initial check-up positively overall with average ratings exceeding 3 (see Tables 3 and 4).

Text Messages. Parents made 7 comments coded as **positive/benefit** (for example, “... *it gives you resources like, so you can you know just in case you need it. Yeah I like that.*”). Three comments were coded as **specific suggestions**, for instance, “...*just give them something to identify with and immediately through the text and if you don’t they are 9 times out of 10, they will erase it or go right past it, give them something to identify with.*” There were also 3 comments coded as **criticism/concern**, with one parent being concerned that “*They look like the uh scam-likely messages I get.*” Physicians made 10 **positive/benefit** comments about the text messages. One physician said, “*Um I love the text messages because then, now you’re following up with them so it sounds great.*” There were, however, also 7 **specific suggestions** and 1 **criticism/concerns** noted. Examples include, “*Start it off, like a familiarity. ‘Oh, we’re back, we’re excited to work w-’ whatever.*” The only concern/criticism of note was a practical one—“*I’d say the only challenge is if they’re going to read it, right?*” Parents and physicians rated the texts messages highly (see Tables 2 and 3).

Parent Training Website. Parents made 13 comments coded as **positive/benefit**. Some examples include, “[with regard to the list of strategies] *I think all of them will help because one child might be different than another child. Maybe that work best for this child, I don’t know. So I say keep them,*” and “*I like how they went through all the steps on how to do timeout.*” Parents also made 1 **specific suggestion** (“*But mostly, like more of a believable situation, like and what do if they don’t want to stay in timeout...*”) and 2 **critical/concern** comments (e.g., “*I did not like the animation.*”). Finally, parents made 9 comments suggesting they **already use the strategies** taught in the program. For example, “*I do have to give them some attention and show them some love and they really respond to that, so yeah and just kind of play with them a little bit. That do help.*” Physicians made 15 comments coded as **positive/benefit**, 12 **specific suggestions**, and 1 **criticism/concern**. An example of **positive/benefit** comments is, “*So um I like the fact that that whole little segment showed a lot of diversity among the kids, boys and girls and racial and all of that,*” Some **specific suggestions** were

about adding content specifically to the timeout video (e.g., what to do if child gets out of time out chair). Parents and physicians rated the parent training website highly (see Tables 2 and 3).

Overall. Parents made 11 **positive/beneficial** comments (e.g., *“Um I, I like the program overall. I would recommend it to others”*) and 1 **specific suggestion** in which it was suggested to send some materials through the mail. No comments from parents were coded as **criticism/concern** for the program overall. Physicians made 12 **positive/benefit** comments (e.g., *“So I like the use of technology”*), had 4 **specific suggestions** (e.g., *“...there needs to be that loop to include the clinician...”*), and 1 comment was coded as **criticism/concern** (i.e., *“I do think we already do a few screening questionnaires in the office anyway and so that’s, we already get feedback that the parents have to a- answer a lot of questions”*). Parents and physicians rated the program positively overall (see Tables 3 and 4); meeting the requirement to end data collection when positive ratings were achieved from both parents and physicians.

Responses to closed-ended questions

Parents were asked about **desired frequency for receiving text messages**. Responses ranged from once a day to once a week with 6 parent-participants suggesting 2-3 times per week. Physicians were asked about **where parents should complete the initial check-up**. Responses overwhelmingly suggested that the initial check-up should be completed in the exam room, rather than the waiting room (e.g., *“Probably in the room just because outside, especially in a pediatric office there’s so many other distractions.”*).

Characteristics of the full PYCC

Based on input across the three iterations, we created a full version of the PYCC intervention. For the initial check-up, given concerns about if the program could fit within a pediatric visit, we split the initial check-up into two parts. In the first part, to be completed at a pediatric visit, parents get feedback about their child’s behavior, watch a brief video about the needs of strong-willed children and are encouraged to learn parenting skills. If parents report not being interested in using the parent training

website, they receive additional motivational content (e.g., identifying possible benefits of learning new parenting skills) to boost interest in using the program. In the second part, parents select what parenting skill they are interested in learning. At this phase, parents are able to pick from the *preventing* challenging behavior modules (see Table 1). Given that many parents reported already using these skills, we emphasize the important ways in which the skills taught in the program are different from those used in everyday parenting. The animated narrator is in both parts of the initial check-up. Responses to the animated narrator were mixed. In each iteration of data collection, some participants highlighted the narrator as a positive aspect, and others noted it as a concern. We choose to retain the narrator given the relative preponderance of positive comments and the positive ratings of the program as a whole, but will continue to seek input about this program element in future program evaluation. Additionally, the CIAS platform, used to create the intervention is still developing and the aim of future versions is to have improved narrator speech quality.

In terms of text messages, we created the system so that families receive 2-4 text messages per week (depending on their selection of modules) and kept messages that did not link to new content minimal. Based on multiple suggestions, we made sure messages included full, complete sentences and began all messages with a familiar greeting (i.e., “Hi! PYCC here.”). Within the parent training website, the training modules include two modules for each parenting skill organized into preventing and responding to children’s challenging behavior. Parents complete module 1 to select the parenting skills they wish to learn about, and then receive 3 text messages over the course of the next week. The modules include diverse families through photographs, animated videos, and filmed video-based content. Specific to the time out module, we included suggestions about what parents should do if their child gets out of the time out chair. Additionally, given concerns about the realisticness of the acting in the time out video, we used humor (in the time out modules and in other modules) to acknowledge that the filmed examples are of actors and asked parents to think of how their child would act in such a scenario.

Discussion

This mixed methods investigation collected input across three phrases from parents ($n = 17$) and physicians ($n = 17$) to create and refine the technology-based program, the PYCC. Participants viewed beta intervention materials and after data collection iterations 1 and 2, refinements were made to program content. The goal of data collection was to achieve positive ratings of the program materials from parents and physicians as evidenced by quantitative ratings that corresponded with “agreeing” with positively worded items about the program and comments coded as positive/benefit about the program. Additionally, it was important to address criticism/concerns and specific suggestions by participants. This was achieved at the third iteration of data collection, which was followed by creating a full version. Consistent with the ORBIT model of intervention development (Czajkowski et al., 2015), this full version of the PYCC will be tested through proof-of-concept and pilot trials before being further evaluated through efficacy and effectiveness research.

Some feedback was not fully incorporated due to budgetary and time constraints. For instance, several suggestions were made to incorporate additional content in the parent training website (e.g., social skills). While we did not have the means to add these modules, we will retain these suggestions for future enhancement of the program. Additionally, a parent in the third iteration expressed not liking the visuals of the initial check-up or BPT website, but expressed liking the program overall; as the software used for the program, CIAS, is further enhanced overtime, we will be able to also enhance the appearance of the program. Additionally, several concerns pertained to accessibility, particularly concerns about technology access among low-income parents. These, of course, are empirical questions that we seek to further answer through evaluating the intervention, with a particular emphasis on rates of program use. To note, however, our preliminary data suggest that access to mobile technology is not a barrier for accessing internet parent training, even for low-income families (McGoron et al., 2018). Additionally, some physicians were skeptical regarding the program’s potential efficacy due to its brevity. We hope to answer this question, adapting the program as needed, in future data collection. Some physicians also suggested

involving the physician more, like having reports in Electronic Medical Records about program use, which we hope to achieve in the future.

Conclusion, Limitations and Next Steps

Results of this mixed method investigation are not generalizable, nor was generalizability the goal of this work. Rather, as stated by Fedele et al. (2019), the goal of such work is to produce a deep understanding of a phenomenon. Data was collected from one geographic area and mothers (no fathers participated) were primarily of one racial group, which is representative of the community where the intervention will be further tested. Parents from different backgrounds could rate the program content differently. This data collection, however, represents important initial steps in creating the PYCC, as guided by the ORBIT model (Czajkowski et al., 2015). The ORBIT model allows for returning to earlier phases, as needed, to further refine the intervention. As the intervention is rolled out in new regions and to varying demographic groups, we will return to Phase 1, and thus collecting additional mixed methods data may be necessary to make appropriate refinements. In line with the ORBIT model (Czajkowski et al., 2015), next steps of program development include moving into Phase 2 and completing proof-of-concept testing, followed by piloting the intervention in a small sample of parents. These evaluations of the full intervention will further inform refinements to the program before efficacy (Phase 3) and effectiveness (Phase 4) trials. Beyond the PYCC, this paper serves as documentation of the process of using mixed methods to refine an intervention in early phases of development; this is an important, but often not completed, step in creating interventions that are engaging and appealing to end users.

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Figure 1.

Overview of the 3-part Parenting Young Children Check-up Intervention

<p>Initial Check-up</p> <p>If there is an elevation in disruptive behavior problems reported on a screener, parents complete a brief tablet-based program. The program:</p> <ul style="list-style-type: none"> • Has an animated, speaking narrator to guide parents through the program. • Gives feedback about screening results. • Has a video about challenging child behavior and parenting skills. • Includes motivational content. • Promotes use of the Parent Training Website. 	<p>Completed at Doctor's Office</p>
<p>Text messages</p> <p>Parents receive text messages, based on the parenting skills they choose to learn, that connects them to the PYCC website. Just a click takes them to the parent training website.</p>	<p>Completed at Home</p>
<p>Parent Training Website</p> <p>Parents can access the website on any internet-enabled device. Interactive, video-based content teaches them strategies to prevent and respond to disruptive child behavior.</p>	<p>Completed at Home</p>

Figure 2.

Changes to feedback chart in Brief Intervention across 3 iterations of data collection

Table 1.

Proposed behavioral parent training skills for PYCC parent training website

Preventing Disruptive Behavior	Responding to Disruptive Behavior
Special Time	Removing attention (“Ignoring”) from disruptive behavior
Labeled Praise	Time-out
Effective Commands	Logical Consequences
Routines	Problem Solving
Offering Choices	
Family Rules	

Table 2.

Description of Qualitative Codes for Semi-structures Interviews with Parents and Physicians

Code	Description
Brief Intervention	
Positive/Benefit	Anything they particularly like about this this part (e.g. I like how the parrot reads out loud, makes use of wait times)
Specific Suggestion/Change	Specific change related to the content being said and displayed (eg. the content should include more information on DBP, should be a different length, the graph should be better etc)
Criticism/Concern	Specific dislikes about the brief intervention. Worry or concern over how this part will work, function, or if the program will work
Where to do BI	Any mention of where the BI should take place (in the waiting room, in the exam room, at home...)
Text Messages	
Positive/Benefit	Anything they particularly like about this this part (e.g. I like how they are short and informational, linked to the website , I really like this text message about special play time etc.)
Specific Suggestion/Change	Any specific suggestion about the text messages (add more information on it, have a step by step guide included , etc)
Criticism/Concern	Specific dislikes about the text messages. Worry or concern over how this part will work, function, or if the program will work with their office flow, patients, or logistically
Desired Text Frequency	How often do they want to receive text messages as part of the program?
Website/Parent Training Video	
Positive/Benefit	Anything they particularly like about this this part, content that they liked (I liked the step by step process shown; Openness to using time out)
Specific Suggestion/Change	Specific change related to the Content, the Look, or the Feel (e.g., Handwriting motion on the videos is too fast, this information is wrong timeout is actually supposed to be only 2 minutes; Change video length; Add more diversity; etc); Comments about what to add etc
Criticism/Concern	Specific dislikes about the website or content. Worry or concern over how this part will work, function, or if the program will work
Expressing they are already doing the strategies in the program	
Overall	
Positive/Benefit	Things liked about the whole program or thinks they found positive
Specific Change/Suggestion	Any suggestion they make or something they think needs to be changed for the whole program.
Criticism/Concern	Specific dislikes about the program. Worry or concern over how the program will work, function

Table 3.

Parents ratings of components of the Parenting Young Children Check-up across three iterations

	<i>M</i> (Minimum-Maximum)		
	Iteration 1 (<i>n</i> = 5)	Iteration 2 (<i>n</i> = 7)	Iteration 3 (<i>n</i> = 5)
Initial Check-up			
The <u>tablet-based intervention</u> appears easy to go through while waiting at a primary care visit.	3.2 (3.0-4.0)	3.3 (1.0-4.0)	3.0 (2.0-4.0)
Completion of the <u>tablet-based intervention</u> will be useful to me as a parent.	3.4 (3.0-4.0)	3.3 (1.0-4.0)	3.4 (3.0-4.0)
It will be useful to my child's healthcare providers if I complete this <u>tablet-based intervention</u>	3.2 (3.0-4.0)	3.3 (1.0-4.0)	3.2 (2.0-4.0)
I like the idea of doing the <u>tablet-based intervention</u> at primary care visits.	3.2 (3.0-4.0)	3.3 (1.0-4.0)	3.0 (1.0-4.0)
<i>Total BI</i>	3.3 (3.0-3.8)	3.3 (1.0-4.0)	3.2 (2.8-4.0)
Text Messages			
This <u>text messages</u> will be an easy way for me to get information and access the website.	3.2 (3.0-4.0)	3.9 (3.0-4.0)	3.6 (3.0-4.0)
Getting information through <u>text messages</u> will be convenient for me.	3.2 (3.0-4.0)	3.7 (3.0-4.0)	3.5 (3.0-4.0)
It appears the <u>text messages</u> will have useful information.	3.2 (3.0-4.0)	3.7 (3.0-4.0)	3.20 (3.00-4.0)
I like the idea of getting information through <u>text messages</u> .	3.2 (3.0-4.0)	3.9 (3.0-4.0)	3.4 (3.0-4.0)
<i>Total Text Messages</i>	3.2 (3.0-4.0)	3.8 (3.0-4.0)	3.6 (3.0-4.0)
Parent Training Website			
The <u>parent training website</u> appears easy to use.	3.2 (3.0-4.0)	3.6 (3.0-4.0)	3.4 (3.0-4.0)
Completion of the <u>parent training website</u> will be useful for me as a parent.	3.2 (3.0-4.0)	3.6 (3.0-4.0)	3.4 (3.0-4.0)
The <u>parent training website</u> would be a useful referral from my healthcare provider.	3.0 (3.0-3.0)	3.6 (3.0-4.0)	3.6 (3.0-4.0)
I like the look of the <u>parent training website</u> .	3.2 (3.0-4.0)	3.6 (3.0-4.0)	2.6 (1.0-4.0)
I like the information in the <u>parent training website</u> .	3.4 (3.0-4.0)	3.6 (3.0-4.0)	3.6 (3.0-4.0)
<i>Total Parent Training Website</i>	3.2 (3.0-3.6)	3.6 (3.0-4.0)	3.3 (2.8-4.0)
Program Total	3.2 (3.0-3.5)	3.6 (3.0-4.0)	3.3 (2.8-3.9)

Table 4.

Physicians' ratings of components of the Parenting Young Children Check-up interventions across three iterations of data collection

	<i>M</i> (Minimum-Maximum)		
	Iteration 1 (n = 6)	Iteration 2 (n = 6)	Iteration 3 (n = 5)
Initial Check-up			
The <u>tablet-based intervention</u> appears easy for parents to go through while waiting at a primary care visit.	2.5 (2.0-3.0)	2.8 (1.0-4.0)	4.0 (4.0-4.0)
Completion of the <u>tablet-based intervention</u> will be useful for many parents.	3.0 (2.0-4.0)	3.0 (2.0-4.0)	4.0 (4.0-4.0)
Parents' completion of the <u>tablet-based intervention</u> will be useful for me as a provider.	2.7 (2.0-3.0)	3.0 (2.0-4.0)	3.4 (2.0-4.0)
I like the idea of parents doing the <u>tablet-based intervention</u> at primary care visits	2.5 (1.0-3.0)	2.8 (1.0-4.0)	3.6 (3.0-4.0)
<i>Total BI</i>	2.7 (2.0-3.0)	2.9 (2.0-4.0)	3.8 (3.3-4.0)
Text Messages			
The <u>text messages</u> will be an easy way for parents to get information and access the website.	3.5 (3.0-4.0)	3.4 (3.0-4.0)	4.0 (4.0-4.0)
Getting information through <u>text messages</u> will be convenient for parents.	3.5 (3.0-4.0)	3.6 (3.0-4.0)	3.8 (3.0-4.0)
It appears the <u>text messages</u> will have useful information for parents.	(3.3) 3.0-4.0	3.4 (3.0-4.0)	3.8 (3.0-4.0)
I like the idea of parents getting information through <u>text messages</u> .	3.5 (3.0-4.0)	3.4 (3.0-4.0)	3.6 (3.0-4.0)
<i>Total Text Messages</i>	3.5 (3.0-4.0)	3.5 (3.0-4.0)	3.8 (3.5-4.0)
Parent Training Website			
This <u>parent training website</u> appears easy for parents to use.	3.0 (2.0-4.0)	3.0 (2.0-4.0)	3.6 (3.0-4.0)
Completion of the <u>parent training website</u> will be useful for many parents.	2.8 (2.0-4.0)	3.4 (3.0-4.0)	3.6 (2.0-4.0)
The <u>parent training website</u> will be a useful referral tool for me as a provider.	3.0 (2.0-4.0)	3.2 (2.0-4.0)	3.4 (1.0-4.0)
I like the look of the <u>parent training website</u> .	2.8 (2.0-3.0)	3.0 (2.0-4.0)	3.4 (3.0-4.0)
I like the information in the <u>parent training website</u> .	2.7 (2.0-3.0)	3.4 (3.0-4.0)	3.8 (3.0-4.0)
<i>Total Parent Training Website</i>	2.9 (2.0-3.4)	3.2 (2.8-4.0)	3.6 (2.6-4.0)
Program Total	2.9 (2.7-3.2)	3.2 (2.8-3.7)	3.6 (3.1-3.9)