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Engaging Parents in the Development and Testing of a Website to Support Social-Communication and Play Development for Preschoolers with Autism Spectrum Disorder

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Abstract

Preschoolers with autism spectrum disorder (ASD) present with social-communication and play challenges and would benefit from interventions targeting these skills. One way to ensure this is by engaging parents in technological supports to learn about an intervention and increase home-school collaboration. Thus, a website could potentially address both needs. This study describes the initial developmental processes of one such website. Specifically, we describe how engaging parents as stakeholders in the website development enhanced its future usability and feasibility. Data were collected through focus groups, interviews, and surveys to obtain parent feedback about website usability and applicability and about the intervention. Survey data were descriptively analyzed. Focus group and interview data were analyzed using systematic qualitative analysis. Parents perceived the website to be useful in helping them target social-communication and play with their preschoolers with ASD and highlighted specific aspects of the website and intervention they perceived as effective. Child outcomes and parent fidelity to the intervention supported these perceived developmental gains. Findings suggest that engaging parents in developmental processes may help ensure usability and applicability of resources and interventions. Furthermore, findings support the use of technology to help parents learn to use an intervention with their preschoolers with ASD. Implications for research and practice are discussed.

Introduction

Challenges in social-communication and restricted repetitive behavior are criteria for an autism spectrum disorder (ASD) diagnosis (American Psychiatric Association, 2013), so addressing social-communication and play skills for children with ASD is important. Previous research supports improved outcomes for young children and families when social-communication and play are targeted in interventions (e.g., Kasari, Freeman, & Paparella, 2006; 2010), and targeting these domains early is essential for the development of language and social interaction skills (Wainer & Ingersoll, 2015). The Advancing Social-Communication and Play (ASAP) intervention was designed as a classroom-based intervention, in which educational teams serving preschool-aged children with ASD were trained and coached to implement the intervention to target social-communication and play skills (Watson, Boyd, Baranek, & Crais, 2011). The intervention is grounded in specific social-communication and play hierarchies that describe a step-wise progression of target skills, or goals, in the two domains (Watson et al., 2011). ASAP was developed through a systematic iterative process that involved phases of focus groups with practitioners, administrators, and families, and usability

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trials in schools (see Dykstra Steinbrenner et al., 2015 for details). ASAP consists of three volumes of a manual focused on (a) assessment of social-communication and play skills; (b) intervention activities and resources; and (c) a parent handbook (Watson et al., 2011). See this website: https://www.med.unc.edu/ahs/asap/ to access the manual, resources, and details regarding ASAP as this existing program serves as a reference tool for the website development in the current study.

Of note, ASAP has been used and implemented in preschools in development and in a multi-site randomized controlled trial with improvements in child engagement outcomes in classrooms (Boyd et al., 2018; Dykstra Steinbrenner et al., 2015). Yet, additional anecdotal and empirical data demonstrate the need to better involve parents and families in ASAP intervention planning and implementation. For example, ASAP research team members who served as classroom coaches informally shared with the research team that during monthly practitioner team meetings, the topic of increasing targeted parental engagement as part of the intervention was often brought up by practitioners participating in the intervention. While the intervention included a parent manual, the implementation processes did not include specific coaching and support around using this manual and purposefully engaging families. This discrepancy led to research team conversations about strategies and supports to better engage parents and families in ASAP planning and implementation.

Within the field of early intervention for children with ASD, there are existing interventions that focus on coaching and supporting parents to implement interventions at home to enhance their child's development (e.g., Schertz, Odom, Baggett, & Sideris, 2018; Watson et al., 2017). These interventions are generally perceived as useful, feasible, and effective by parents and families (Bradshaw, Steiner, Gengoux, & Koegel, 2015). Expanding upon this, recent research suggests promising results for web-based platforms and virtual coaching leading to improved parent and child outcomes for families of children with ASD (e.g., Bearss et al., 2018; Bosivert & Hall, 2020; McGarry, Vernon, & Baktha., 2020; Pickard, Wainer, Bailey, & Ingersoll, 2016). Specifically, parents have learned to conduct assessments (Talbott et al., 2020) demonstrated improve knowledge and self-efficacy when interacting with their child (Bosivert & Hall, 2020). Other researchers have reported parents benefitted from technological supports (or eLearning supports) to implement evidence-based practices (EBPs) with their children with ASD (Bearss et al., 2018; Jang et al., 2012; McGarry et al., 2020). Many of these interventions have also demonstrated promising parent and/or child outcomes after using EBPs (McGarry et al., 2020; Meadan et al., 2016). Although these findings suggest emerging evidence that using technology may be a viable means for helping parents and families identify needs and work with their young children with ASD, these models are generally not directly connected to school-based services.

Research indicates that parents desire to have personal communication with teachers to learn to use school approaches and strategies at home (Wanat, 2010). Further, parents' use of intervention strategies at home maximizes intervention benefits and supports improvements in child outcomes (El Nokali, Bachman, & Votruba-Drzal, 2010; Henderson & Mapp, 2002; Topor, Keane, Shelton, & Calkins, 2010). One potential means to support parents in learning and implementing evidence-based interventions being used in school is through web-based platforms. Given today's frequent, often pervasive, use of technology such as smartphones and tablets, in addition to parents' and teachers' limited time, creating technological linkages between home and school could enhance communication and collaboration. To our knowledge, very few researchers have evaluated the feasibility of using a web-based platform designed for parents of children with ASD who are enrolled in preschool education programs, with a focus on parents learning to implement the same intervention that is being implemented in school.

Including Stakeholders in Development

The importance of including stakeholders and end-users in intervention development and implementation is becoming increasingly clear (Dingfelder & Mandell, 2011; Dykstra Steinbrenner et al., 2015; Elsabbagh et al., 2014). A number of frameworks in implementation science, a field dedicated to the study of how to effectively translate EBPs into real-world use, include phases that engage stakeholders from the earliest stages of development (e.g., Aarons, Hurlburt, & Horwitz, 2011; Bertram, Blasé, & Fixsen, 2015). The improvement and sustainability of interventions is an ongoing process integrated into phases of intervention development and implementation (Bertram et al., 2015). Furthermore, family-centered service delivery, in which parents and families are involved and engaged in decision-making and intervention implementation, is recommended in early intervention service provision (e.g., Division for Early Childhood, 2014; Dunst, 2002). Purposefully including and engaging families in early intervention services may lead to increased family capacity and empowerment which would suggest improved child and family outcomes (Trivette, Dunst, & Hamby, 2010). Thus, engaging families as part of early intervention development processes should lead to increasingly usable, relevant, and effective early intervention approaches.

The overall purpose of the current project, Promoting ASAP Collaboration through Technology (PACT), is to enhance the existing ASAP intervention through development of a technologically supported system of engaging parents in the intervention and later increasing home-school collaboration. The website supports parents in implementing ASAP at home. Once parents have created their account and log in, they are guided through a series of videos that explain the importance of targeting social-communication and play skills for young children with ASD and provide a brief overview of ASAP's purpose and history. They are then prompted to answer a series of questions (approximately 3–5) addressing their child's current language, social-communication, and play levels (See Image 1). Answers to these questions generate individualized

goals based on the child's needs. Through the website, parents can also view ASAP implementation and strategy examples for each targeted goal and monitor their child's progress (see Image 2). As the child progresses through the ASAP social-communication and play hierarchies (see Image 3), parents can use the website to guide their activities and implementation of ASAP strategies at home. Simple boxes labeled as "Completed," "Get help," or "Skip" help parents to navigate through the goals on ASAP's hierarchy. The website includes a share feature, where parents may choose to share the ASAP intervention strategies and resources with other family members, caregivers, educators, and service providers. The website additionally produces and sends brief bi-weekly quick "tips" on addressing social-communication and play in their daily activities and routines to parents via text or email to help parents integrate ASAP into their daily routines and activities. At the current time, the website is not publicly available for access.

The research plan for PACT included an iterative developmental process across three phases. In iterative processes, products or interventions are systematically developed in cycles while continuously using feedback to improve the product or intervention (Dykstra Steinbrenner et al., 2015). The first two phases of PACT involved developing and testing the ASAP at Home website. Phase one included end-user feedback (i.e., parents, teachers, and school administrators) through focus groups in the development of the ASAP at Home website to determine its usability from the parents' perspectives on standard and mobile features. Phase two assessed parents' evaluations of the feasibility and acceptability of using the ASAP at Home website to implement the ASAP intervention and collected preliminary child level outcomes on child engagement in parent–child interactions. Methods in Phase two included case studies and a single-case research design study. Finally, in Phase three, the research team investigated the co-implementation of the ASAP intervention by school providers and parents across home and school contexts in a quasi-experimental study. The current manuscript describes the two development phases, focusing on stakeholder feedback, perceptions, and increased use of the intervention.

Given the importance of including stakeholders in the intervention implementation process, during the development of the ASAP at Home website, we address the following research questions in this paper: (1) What are parent perceptions of website features that would support ASAP implementation at home and home-school communication? (2) What website features do parents perceive as feasible, useful, and/or challenging while using the ASAP at Home website and did they increase in ASAP fidelity after using the website?

Methods

Iterative Approach

The current study utilized an iterative, user-centered approach in the development and initial implementation of the ASAP at Home website. User-centered approaches incorporate intended users of a product or intervention in its developmental process to ensure usability and translation of research-based interventions into practice (Lyon & Koerner, 2016). In the case of the ASAP at Home website, the approach included obtaining and using parent input on the website design conceptualization and field usability testing. University Institutional Review Board approval was obtained prior to beginning the study. During website development in Phase one, stakeholder perspectives and feedback on website features (both standard and mobile) from the parent focus groups were obtained. Field testing in Phase two included an iterative process of usability testing and design improvement. Parents used the website and implemented the ASAP intervention in their home with their preschool children with ASD. Ratings on website usability and feasibility as well as parent perceived benefits and challenges related to ASAP implementation using the ASAP at Home website were obtained through surveys and interviews. Child level data were collected on child engagement levels.

Participants

For all parent participants, informed consent was obtained. Parents were recruited from the Autism Research Registry through the Carolina Center for Developmental Disabilities, of families of children with ASD who have agreed to be contacted about their participation in research. The inclusion criteria for focus group participation in Phase one included the parent (a) had a preschool-aged child with ASD currently enrolled in a school program, (b) was willing to contribute feedback on the website, and (c) was able to converse and read in English in order to comprehend and communicate about the website mock-ups. The eligibility criteria for the initial website users in Phase two were the parent (a) had consistent internet access or owned a Smartphone, (b) consented to implement the intervention with the child, and (c) was able to converse and read in English in order to comprehend intervention materials on the website.

Table 1 presents the demographic information of a total of six parents who participated in focus groups, contributing to the website development process and another six parents who tested the website and implemented ASAP at Home. While all parent participants were mothers, they were diverse in terms of race, socioeconomic status, geographical location of residence, and technology comfort level. It is noteworthy that half of the focus group participants (3) were non-white, and more half of the website users (4) were non-white participants.

Data Collection: Phase One

The initial iterative website development process began by establishing a partnership with 3C Institute, a company specializing in behavioral health technology and software development. Using the manualized ASAP intervention, the prototype of the ASAP at Home website was created which included four chunked components of assessment, implementation, home-school

Table 1. Parent Demographics.

Category	P1	P2	Category	P1	P2
Race			Technology access		
White	3	2	Computer	6	6
Black or African American	2	2	Tablet/iPad	6	4
Asian	1	1	Smartphone	6	6
Mixed	0	1			
Highest education			Primary home-school communication		
High school graduate or GED	1	1	Phone	4	4
Some college or 2-year degree	0	0	Text message	5	4
College graduate	1	2	Notebook	2	1
Advanced graduate or	2	1	Email	5	2
professional degree	2	3	In-person	3	4
Combined household income			Parent comfort level with technology		
$20,001–$40,000	1	0	Somewhat comfortable	1	2
$40,001–$60,000	1	1	Very comfortable	5	4
>$90,000	4	4			

Note. P1= Phase 1 focus group parents; P2 = Phase 2 field user parents.

Table 2. Development of Four Chunked Website Components.

	Assessment	Implementation	Home-school communication	Technical support
Website features	ASAP overview	Video library/Picture dictionary	Texting/emailing features	Tutorial
	ASAP goal hierarchy	PDF activity sheets		
	Child language assessment	Self-assessment/ reminders	Automatic data sharing (assessment and goal progress/mastery)	Trouble shooting guide
	Child play and social-communication skills assessment	ASAP tips of week		

communication, and technical support. See Table 2 for website features within each of four components.

Then, parent input and feedback on the presentation of website features that are important to support ASAP assessment, implementation, and home-school communication were collected from parent focus group interviews. The primary purpose of the first focus group was to identify major deficits prior to the completion of the first mock-up. Participants began the focus group with introductions and establishing rapport with one another. Then they completed a questionnaire containing sociodemographic as well as general technology questions such as technology access, technology comfort level, and strategies used to communicate with teachers. Following the questionnaire, both ASAP and PACT projects were introduced to help participants understand the purpose of the focus group and gain an overview of the website. Next, Microsoft PowerPoint slides were utilized to present mock-ups of the potential website design (e.g., displays, layouts and flows) to elicit parent's preference and explanations of their preferred and non-preferred aspects. Additionally, participant-initiated questions and conversations were encouraged. The first focus group lasted approximately 1.5 hours.

The 3C Institute used data analyzed from the first focus group to make needed revisions to the ASAP at Home website. In the second focus group, the same six participants were invited back to try out the preliminary version of the website. Participants were oriented to the changes made based on their feedback provided in the first focus group. The second focus group lasted approximately 1.75 hours. Data from both focus groups were used to refine the ASAP at Home website and prepare for pilot-testing in phase two.

Phase Two

We recruited six additional parent participants to use the ASAP at Home website and pilot the intervention at home with their preschool children with ASD. We targeted three parents in each group because of time and resource constraints indicating single-case design would be the most appropriate fit for these early development phases of the study. As mentioned previously, our participants had diverse demographic backgrounds so we felt three participants in each group would provide a variety of perspectives related to the website itself. Specifically, we used a case study (AB) design with the first

group of three parents. An AB design was used in this first cycle so that initial parent users could try the website and provide relevant feedback in a short period of time. After using input and feedback received from the first group to make website and study design improvements, we employed a Multiple-Probe (MP) single-case research design with the second group of three parents. All parents completed the demographic and technology questionnaire and engaged in baseline play sessions before completing parent training on the ASAP at Home website and implementing the intervention. Child engagement data were collected although the current study is focused on *parent perceptions and gains* relative to using the website and its impact on their own and their child's skills. Separate studies will more critically examine child outcomes with child engagement level as a dependent variable.

After using the website to implement the ASAP intervention, parents in both studies completed a survey that assessed their perceptions and experiences. Parents additionally participated in individual semi-structured interviews conducted by the first author, who has experience conducting interviews and analyzing qualitative data. The individual interviews included questions on participants' perceived acceptability and effectiveness of the prescribed ASAP procedures. The questions additionally addressed encountered facilitators and barriers to website use and overall feasibility and usefulness of the website. All interviews were conducted in participants' homes and lasted between 15 and 45 minutes for each participant. The interview protocol may be viewed in Supplemental Information.

Data Analysis

Qualitative Data: Phase One Focus Groups and Phase Two Individual Interviews. Due to a similar approach and to avoid redundancy, qualitative data analysis procedures for focus groups and individual interviews are described together. Both interviews and focus groups were audio-recorded and transcribed verbatim. Observational notes were recorded of nonverbal communication between researchers and participants and study settings. Multiple coding cycles were conducted to ensure data were representative of parents' perspectives (Saldaña, 2016). The primary coder (second author for focus groups, first author for interviews) reviewed the transcriptions word by word, descriptively coded for themes and subthemes, and wrote interpretive notes attached to the codes. Memos were recorded to capture thought processes and increase awareness of researcher bias (Saldaña, 2016). Focus group transcripts were coded using Microsoft Word comment feature and interviews were coded using Atlas.ti qualitative coding software. Example focus group descriptive codes included "Teacher communication method preference" and "Video preference." Example interview descriptive codes included "Goal selection," and "Website benefits." Themes emerging from focus groups included "Prefer communicating via text," and "Prefer short videos." Themes from interviews include "Learned about ASD" and "Enjoyed brief tips."

The secondary coder (first author for focus groups, fourth author for interviews) was provided a codebook developed by the primary coder and conducted the same coding procedures. In both cases, the two coders met to discuss any coding discrepancies and reach a consensus. This consensus coding process was conducted to ensure data trustworthiness and limit researcher bias (Campbell, Quincy, Osserman, & Pedersen, 2013). Both coders cross-examined the transcripts and observational notes to see if there was any important information missing. For example, during interview analysis, the secondary coder was less familiar with the ASAP intervention and did not recognize specific references to the hierarchies and social-communication and play skills. This helped the primary coder recognize her own familiarity with the ASAP intervention was influencing her interpretation of the data. However, upon discussion, the two coders were able to reach a consensus through discussion and explanation about the intervention components.

Quantitative Data: Phase Two Parent Feasibility and Fidelity

Feasibility. The feasibility survey consisted of 5-point Likert scale questions covering overall usefulness (11 items), website content (9 items), visuals (4 items), and usability (8 items). This survey was adapted from a feasibility survey developed and used by 3C Institute used on other websites and technologies developed by the group. A rating of one indicates 'strongly disagree' and the rating of five indicates 'strongly agree'. Individual items on the feasibility questionnaire may be viewed in Supplemental material. Descriptive statistics were computed (i.e., means and *SD*s) for each domain total score; individual item scores were cross-examined.

Parent Fidelity. In addition, at each research home visit, 10-minute parent–child videos were coded for child joint engagement states and to observe parent fidelity to the ASAP intervention. The videos were of the parent and child playing with a specific set of toys (brought by the home visitor) that lent themselves to social-communication and play interactions (e.g., pretend play figures and objects, musical instruments, and puzzles). Parent fidelity was assessed through these videos for all intervention sessions. We used a checklist to determine if intervention components and strategies were used/not used. In addition, rating scales were used to assess parent characteristics during sessions (e.g., ability to gain child's attention, adult affect). If fidelity fell below 80% or if the same intervention component was missed for two consecutive sessions, a booster training was provided to the parent (e.g., review and model implementation strategies).

Results

What are Parent Perceptions of Website Features that would Support ASAP Implementation at Home and Home-school Communication?

Findings from the parent focus groups in Phase 1 were used to address website development. The focus group findings included a variety of parent preferences. Figure 1 demonstrates how feedback from parent focus groups was integrated into the fully developed ASAP at Home website that was used in Phase 2. As it relates to ASAP specific content such as the social-communication and play hierarchies, parents shared that they were comfortable identifying where their own children's skills fell on the hierarchies. They also preferred that the website allow them to save what was completed and remember where they left off. Similarly, parents requested a checklist to indicate activities that are completed and those that have yet to be completed.

The ASAP at Home website developed for Phase 2 supported parents in assessing their child's current social-communication and play skills at home and generating individualized goals based on the child's needs and developmental levels. Through website use, parents also learned important content about the ASAP intervention and the importance of targeting social-communication and play. They were able to view ASAP implementation examples, monitor their child's progress, and access several activities and resources to help them implement ASAP intervention in their homes.

What Website Features do Parents Perceive as Feasible, Useful, and/or Challenging in the ASAP at Home website and did they increase in ASAP fidelity after using the website?

Overall, participants overwhelmingly enjoyed and appreciated using the website to learn about the ASAP intervention and implement it with their children at home. This was supported by both qualitative data in interviews and focus groups and quantitative data in the feasibility survey. See Table 3 for aggregate data from the questionnaire in the feasibility survey, Table 4 for a summary of focus group data, and Table 5 for a summary of interview data. Notably, the parents who participated in the MP and used the website for a longer period and more consistently rated the website features and applications higher.

Website Adaptations after AB Study

After the AB study, we used parent feedback to make website and study design improvements. Specifically, a password reset option was added and research staff noted the importance of informing parent users of the 'share' feature on the website. While only one parent shared the website with other caregivers and healthcare providers in the AB study, all three parents shared the website in the MP study. Furthermore, children enrolled in the AB study had high child engagement levels at baseline, leaving little room for growth in this area. Thus, we adapted the study model to include baseline data indicating that children spent less than 60% of the time engaged in coordinated joint engagement to determine eligibility in the study.

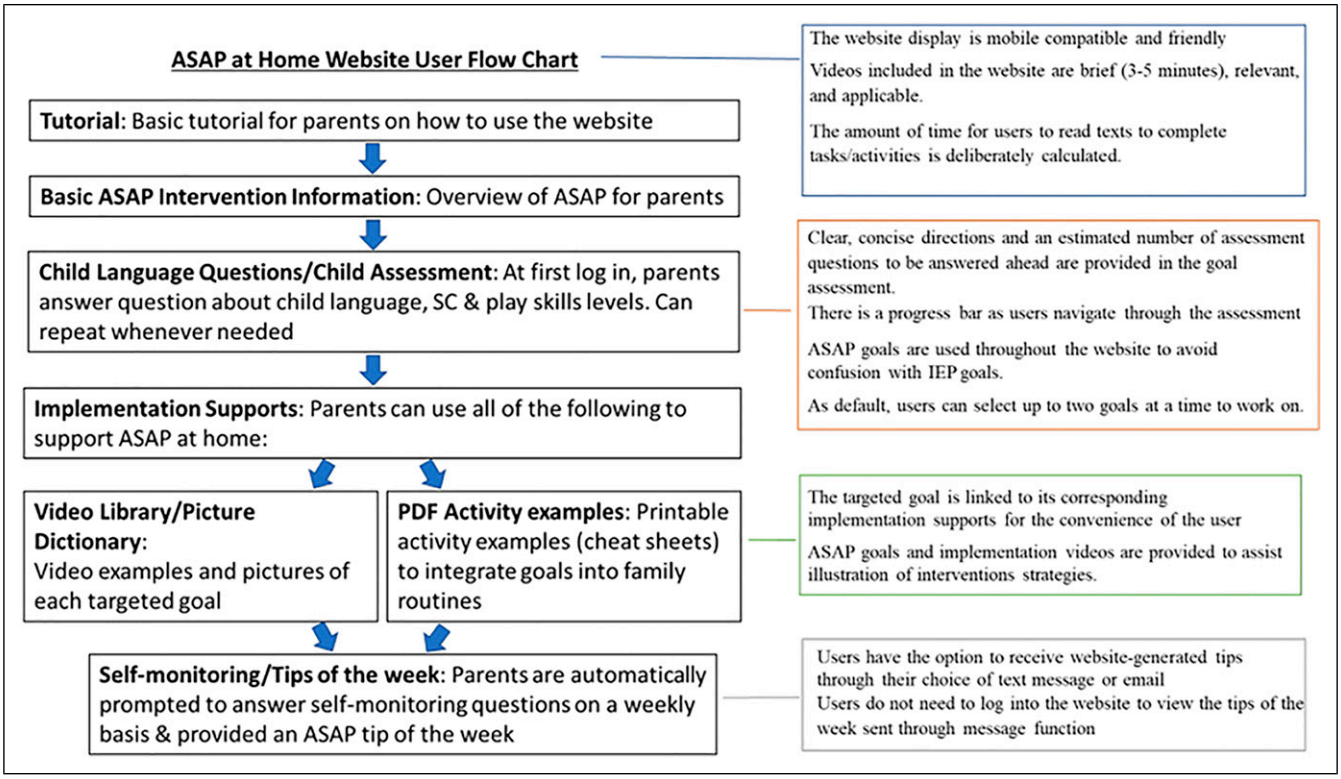

Figure 1. Integration of focus group data into website development.

Table 3. The ASAP at Home Website Questionnaire Results.

Participants ID domain total	SCD1	SCD2	SCD3	SCD4	SCD5	SCD6	Mean (SD)	Min	Max
Overall usefulness	47	37	48	54	55	55	49.3 (7.0)	11	55
Website content	35	30	36	44	45	43	38.8 (6.0)	9	45
Visuals	17	16	16	20	20	16	17.5 (2.0)	4	20
Videos	19	20	20	23	25	24	21.8 (2.5)	5	25
Usability	32	31	32	35	40	39	34.8 (3.9)	8	40

Note. Individual items were rated on a Likert style scale with 1 as strongly disagree and 5 as disagree. This table represents the raw sum of scores as rated by individual participants.

Table 4. ASAP at Home Website Development – Focus Group to Development.

Themes	Selected excerpts (participant ID)	website features that incorporate focus group findings
Variety of technology preference	Phone only, Phone first and computer for complex tasks, Computer only Generally preferred using "apps"	The website display is mobile compatible and friendly
Preferred methods of communication with educators/ health providers	Text messages or emails. Phone calls for urgent issues Notebook	Users have the option to receive website-generated tips through their choice of text message or email
A single, unified communication portal	"…I hate getting one from my doctor says you have a new message. And now I have to log in here and click on five things to get to that new message."	Users do not need to log into the website to view the tips of the week sent through message function
The importance of keeping information on the website succinct	"I usually skip all the tutorial videos. – you know I like skip, skip here, and then I click around and man, if I can't figure it out then I'll look for a help button" (3/4 participants)	Videos included in the website are brief (3–5 minutes), relevant, and applicable The amount of time for users to read texts to complete tasks/activities is deliberately calculated
Guidance on how to use any ASD intervention strategies or supports is desired	"Well, I've been handed things and told, here, try this. And then I get home and I don't know where am I supposed to start. I have this huge book with pictures and have no clue what to do with it"	ASAP goals and implementation videos are provided to assist illustration of interventions strategies.
ASAP goal assessment	"If you tell me it will take approximately 20 minutes, then I'm thinking about all the things that I can be doing in 20 minutes. If you just tell me the number of questions rather than the time that it's going to take, you are more likely to get my participation."	Clear, concise directions and an estimated number of assessment questions to be answered ahead are provided in the goal assessment. There is a progress bar as users navigate through the assessment
ASAP goal selection	The term "goals" may be confused with their child's IEP goals at school."Preferred to see only a few goal choices at a time so as not to feel overwhelmed"	ASAP goals are used throughout the website. As default, users can select up to two goals at a time to work on
ASAP goal implementation	Participants wished that intervention resources were linked to ASAP goals and daily routines/ activities	Individual resources and strategies linked to goals

The following section describes a summary of first user ratings on (a) website usability, usefulness, and content, and (b) parent and child benefits from using the website.

Website Usability, Usefulness and Content

Most parents found the website to be user-friendly and described it as easy to learn and meeting their needs and expectations. Some parents commented on the simplicity of the website, "It was pretty easy and I'm not computer savvy at all." However, there were a few reported challenges navigating the website itself, "I did have a little bit of trouble with trying to get my second goal. But once you [research team member] contacted me, I was able to get through it pretty well," one parent shared. This parent needed support from the research team in order to move her child up to the next target goal. Similarly, another parent noted, "The navigation was hard for me to figure out at first because I couldn't figure out how to select the goals." This parent also received help from a research team member in setting up her child's goals.

Parents rated the overall usefulness including content and visuals on the website quite high with the majority

Table 5. Main Themes from Interviews.

Descriptive code	Themes	Theme definition	Example quote
Goal selection	Challenging to select goals	Pertaining to selecting the goal generated by the website or not	"I'll say most challenging was selecting a goal"
	Perceived goal mis-match	Pertaining to parents' thinking the website-generated goal was not right for their child	"I would have to say, I thought that maybe he already knew how to do the suggested goal when I initially answered those assessment questions, but it was a good tool to just look back at and just to see, well, he really did need that goal. It helped me be more aware of what he actually needs."
	Appreciated flexibility in selecting goals	Pertaining to parents' ability to use the website-generated child goal or to choose another to address	"I'm glad that you were able to find something that aligned with you know your expectations"
Website benefits	Enjoyed brief tips	Pertaining to parents' appreciation of website-generated bi-weekly tips suggesting simple ideas for using ASAP in daily routines and activities	"I really liked that the daily tips that were on the website – those were really cool"
	Learned useful strategies	Pertaining to parents' perceived effective techniques they learned through the website	"He [child] liked the peek-a-boo. I'd give him the blanket so maybe he could do it. He liked that"
	Gained understanding of development and ASD	Pertaining to learned content about child development and ASD provided by the website	"I think that that's also a very important part. Because I understand more about the development of children with autism's behavior and their understanding of different things"
	Easy to use	Pertaining to ease of navigating through the website	"I loved how self-explanatory everything was. It was not like anything I'd ever seen. It was juts 'go to the website, get what you need, and go do it."
Website challenges	Struggled to navigate	Pertaining to challenges of navigating through the website	"I did have a little bit of trouble getting to my second goal"
	(AB only) desired password reset	Pertaining to the lack of password reset built in to the first iteration of website usage	"I mean the password reset was one challenge"
Videos	Appreciated goal example videos	Pertaining to perceived benefits of the videos demonstrating each goal	"The videos were huge-getting examples of joint attention"
	Appreciated strategy implementation videos	Pertaining to perceived benefits of the videos demonstrating strategies to use ASAP	"That's one thing I did pick up from one of the videos – putting the toys near your eyes to make him look up at you"
ASAP intervention	Enjoyed intervention	Pertaining to having fun with ASAP	"Oh, I loved it. She [child] enjoyed it too. She loved to play with the fruit."
	Appreciated hierarches	Pertaining to parents' perceived benefits of the ASAP social-communication and play hierarchies	I love the stair-step graph. So, once I learned how to bop around, I'd say, 'she's got this,'"
Study process	Benefitted from home visitor	Pertaining to perceived benefits of having a home visitor (beyond that of collecting data)	"Talking to [home visitor] was great. She always had great feedback and was always very observant in the things she noticed about [child]"

agreeing and strongly agreeing with survey statements such as "The information on the ASAP at Home website was easy to understand" and "I found the photos, graphics and animation combination to be a clear way to present the material." They reported the website provided them with relevant information that helped them interact with their children.

Some information perceived as helpful was specific to the ASAP intervention components such as the social-communication and play hierarchies as this parent shared:

> I think the hierarchies are a very important part. Because I understand more about the development of the children's behavior, their understanding of different things. It gives the wholistic idea of how they learn new things or learn new strategies. So, I understand why he cannot do this, and he can do that.

Similarly, one parent explained how ASAP tools and resources on the website helped her understand her own child's strengths and weaknesses in the domains social-communication and play. Parents further appreciated the simple website-generated tips emailed or texted to them, as illustrated by this parent, "I really liked the bi-weekly tips. Those were really cool. Actually, I liked to pick them out and be like, 'Oh cool, I want to try this today'." Another parent highlighted how the tips served as a reminder to implement ASAP and said, "ASAP sends us emails and tips and it reminds us to use the strategies."

Specific Strategies

Parents reported learning some new and effective strategies from the website. Specifically, parents learned the importance of showing their child that they expect them to do something with anticipatory facial expressions and gestures (Mahoney and MacDonald, 2007). One parent said, "Waiting with anticipation – that was the big thing." Another parent said:

> I think it was a strategy that suggested to blow a little bit of bubbles and wait. I don't know why it never occurred to me, because I usually just blow, blow, blow. I just did a little teeny bit an then I waited and then my child was like "mo, mo," and I said "more what?" He said, "mo bubbles!"

Other parents shared that the website helped them learn to facilitate play with their children. They also highlighted the convenience of revisiting the website any time if they needed reminders as demonstrated by this parent's comment, "The website provided me with a lot of strategies to communicate and play with my son. I like that I can always go back to the website to remind myself and learn new strategies to play with him when needed." Another parent commented, "It is convenient. I can access it anytime and anywhere."

Website Videos and Visuals

Similarly, parents found the website visuals and videos to be particularly beneficial. They liked the colors used to differentiate between social-communication and play domains. In particular, they highlighted videos (explanatory videos about ASAP and the importance of targeting social-communication and play) as enhancing their understanding of content and application. One parent expressed, "I liked the videos – how they explain everything about ASAP before you actually start doing the intervention."

The website also includes example videos of each target skill and many of the implementation strategies in action. One parent shared the videos provided useful "examples of getting joint attention and face to face time. The videos were huge." Likewise, another parent noted, "I like the videos, they showed me things to do around the house." These statements suggest the videos helped parents learn how and when to implement ASAP. Though a few parents reported minor problems with videos buffering, in these cases, parents still reported the videos as being useful.

Assessment

Regarding the website-generated assessment process, most parents reported it took the right amount of time and the questions were not difficult to answer. However, some parents felt the goal generated by the website was not appropriate for their child. In some cases, the parents then realized the goal identified by the website did apply to their child as illustrated in the following comment:

> I would have to say, I thought that maybe he already knew how to do the suggested goal when I initially answered those assessment questions, but it was a good tool to just look back at and just to see, well, he really did need that goal. It helped me be more aware of what he actually needs.

This parent shared she did not think the initial website-identified goal was appropriate for her child, but as she started to work on the goal, she realized it was more accurate than she originally believed. These findings suggest the need to clearly communicate information to parents about goal selection so that they know that they may choose to work on any goal and change to another goal at any time.

Specific Information Linked to Goals

Most parents reported it was helpful to have specific information linked to individual goals. One parent desired additional information linked to each social-communication and play goal on the hierarchies. In general, parents benefitted from the background information and strategies linked to goals.

Parent and Child Benefits from Using the Website

Parents attributed many benefits to using the website. They described the important role the website played in their gaining of skills, as this parent explained,

> We cannot rely totally on school or other resources. I think parents are the most important source to help the kids. I think that that's one of the most important parts. And the second part is, those strategies can help me to help my child accomplish and achieve those goals.

Other parents shared how the website helped them try new things, such as this parent, "And so I got to learn how to

pretend play with things out of my comfort zone. That was really nice." Parents also described how the website helped them learn about ASD, as expressed here, "We just wanted to have more of an understanding of autism and how to help him, with more structure. And I feel like the website really helped us learn new things…things we didn't even think of."

Parents additionally shared that their children gained play and social-communication skills while using the website and implementing ASAP intervention at home. Relative to play skills, a parent shared, "He's pretend playing at school, so not only do we notice, but the school is actually noticing." Another parent noticed how her child began independently engaging in pretend play, "I actually caught him on his own and he was taking his dogs and he was grooming them and taking out his doctor kit and listening to their heart and everything." Another parent noted gains in her child's social-communication skills and said, "He's definitely been communicating a lot more. I found that waiting for him allowed him to kind of ask me more and it's really prompted him to talk more."

These benefits were supported by observational data on child engagement levels and parent fidelity. Children demonstrated improvements in their ability to engage with people and with people and objects at the same time. Parent fidelity through these pilot tests was 92.7%.

A final benefit parents reported following participation in the study is not directly related to using the website, but to the research staff who collected parent–child videos in the home. One parent shared, "I think it really is all because of our home visitor. She came with a positive attitude. I really liked that. She was awesome. I mean if we could just kidnap her and have her with us all the time, we would." Other parents agreed the home visitor had excellent and helpful feedback relative to engaging with their children, using the website, and implementing the ASAP intervention.

Overall, parent feedback on the website greatly enhanced the potential applicability of the website once it is used in schools and homes simultaneously. Parents helped elucidate the most helpful features of the website in addition to identifying a few adaptations to improve the website. Furthermore, having access to information and foundational knowledge about ASAP may have helped empower parents to successfully use the intervention strategies.

Discussion

Researchers suggest in order to ensure interventions are usable by those intended to use them, it is important to include end-users from the onset of intervention development (Dingfelder & Mandell, 2011; Dykstra Steinbrenner et al., 2015; Elsabbagh et al., 2014). End-users' knowledge gained, and challenges faced during an iterative development process are integral to enhancing an intervention (Dykstra Steinbrenner et al., 2015). Thus, understanding users' habits and preferences as it relates to technology is critical in developing a website as a means for intervention. The findings in this study suggest that engaging parents and families as stakeholders in the development of the ASAP at Home website contributed to initial perceptions of its usefulness and effectiveness. Additionally, collecting parent feedback following the case study and the multiple-probe single-case design study helped our research team make revisions to the website resources, develop troubleshooting guides, and revise data collection procedures to better capture child engagement before launching a group study using ASAP at Home in conjunction with the ASAP school-based intervention.

Parents reported improved child social-communication and play skills when they were implementing the ASAP intervention at home, supporting the notion that technological supports could contribute to improved outcomes (McGarry et al., 2020; Meadan et al., 2016; Wainer & Ingersoll, 2015). This also was supported by the engagement data collected during parent child interactions. Furthermore, parents reported the website helped them learn about and understand ASD and the significance of helping their children gain social-communication and play skills. This supports the family-centered principle that empowering parents with the knowledge and resources to make decisions and implement interventions with their own children will help build capacity (Dunst, 2002; Trivette et al., 2010). The website provided parents with knowledge and information that helped them learn how and why ASAP could benefit their children. This new knowledge may have led to increased parental buy-in to the intervention and increased feelings of empowerment in using the intervention, leading to family-capacity building (Trivette et al., 2010). Providing parents with knowledge about why the intervention is important appears to have enhanced their own feelings of self-efficacy.

This sense of empowerment and perceived family-capacity building may be particularly important for parents of preschoolers with ASD. When receiving Part C (Early Childhood Intervention) services, all services are intended to be family-centered, which includes involving families in intervention decision-making and implementation (Dunst, 2002). When families transition into Part B (Early Childhood Special Education) where services primarily are delivered in schools, it is reasonable to assume a perceived drop in family involvement. Parents of children with ASD report the desire to be more involved in their children's schooling, and to learn effective strategies used in school that they can use at home to address challenging behaviors (Meadan et al., 2016). The technological supports provided by the ASAP at Home website could potentially assist in closing this gap and helping to ensure that families remain involved in service decisions and provision when their children enter the school system.

The findings in the current study support the use of technology to help parents learn to implement an intervention align with previous research (e.g., Bosivert & Hall, 2020; McGarry et al., 2020; Meadan et al., 2016; Wainer & Ingersoll, 2015). This information could extend to early childhood education and intervention teams hoping to increase communication

with parents and caregivers. Although individual classroom teams cannot feasibly develop a website to foster collaboration, parents highlighted many other possibilities for using technology to accomplish this. Using phones and related technology may be an effective channel to provide more information to parents about child goals in the classroom and about strategies and techniques classroom teams are using to address these goals. Furthermore, sending out brief, simple tips to all parents about what is working in the classroom every week or every other week to parents may help translate classroom activities into strategies for home activities.

One noteworthy finding was parents' specific references to their home visitors in the interviews. The home visitor's main role was to video record parent–child interaction videos for data collection. Yet, the home visitor's knowledge about ways to engage young children with ASD and familiarity with the website supported and enhanced parents' experiences. Furthermore, parent participants in the focus groups also expressed the need to be given supports on "how" to implement any new strategy or use new materials. This finding points to the potential need to pair technology with additional supports, such as a preschool classroom teacher or a related service provider (e.g., occupational therapist or speech and language pathologist) who is implementing ASAP in the school setting, in order for successful translation of interventions into different practice environments.

As with all research studies, there are limitations inherent in the current study. First and foremost, in both study phases reported here, the sample size was small. This is common in single-case design but limits the generalizability of the results. Furthermore, the small sample size limits the generalizability of the qualitative data. While qualitative data are not intended to be generalized, it should be noted that these parents' lived experiences may differ significantly from other families. We also did not include non-English speaking families in both phases of the study which could further limit our results. Thus, the website's usefulness and effectiveness could be better understood with additional research with increasingly diverse participants.

Conclusion

Children with ASD struggle with social-communication and play skills (Rutherford, Young, Hepburn, & Rogers, 2007; Wetherby, Watt, Morgan, & Shumway, 2007). Thus, targeting these skills in school and at home is important to maximize intervention/treatment benefits and improve skill generalization. Gathering parent perceptions provided valuable information on the feasibility of the ASAP at Home website and highlighted supports that were important to them when working with their children. The results from these first two study phases indicate that parents are willing and able to use technology to learn and implement an intervention and that this technology has the potential to expand to facilitate communication and collaboration with school-based teams that are also using the ASAP intervention. In order for innovations and interventions to be useful, the inclusion of stakeholders in developmental processes is critical.

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Supplemental Material

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