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Training Parents of Children with ASD Via Telehealth to Implement Communication Interventions: A Narrative Review

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Abstract

Purpose of Review Children with ASD experience communication deficits that necessitate intervention. Involving parents of children with ASD in interventions is helpful for generalization of skills and the overall success. Also, involving parents is beneficial for their mental health. Not all children with ASD and their families have access to intervention services especially those who live in rural or underserved areas. Fortunately, telehealth is a cost-effective option to provide services to children with ASD and their families. In this narrative review, we synthesized the existing literature about training parents of children with ASD via telehealth to implement communication interventions.

Recent Findings We found different telehealth modalities were successful in coaching parents on implementing communication interventions for their children with ASD. The efficacy of parent-mediated intervention in increasing communication skills was evidenced in most studies, but generalization and maintenance were assessed in a few studies. Most studies reported positive social validation outcomes from the viewpoints of the participating parents.

Summary While most studies yielded positive outcomes, further research is needed to address gaps such as the effectiveness of individual components of multicomponent training packages, the social validity from the perspective of children, and the role of different implementers in parent training.

Keywords Autism · Communication · Intervention · Parents · Telehealth

Overview

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder which appears early in a child's life and is characterized by impaired social communication and interaction as well as restricted, repetitive, and stereotyped patterns of activities, behaviors, and interests [1].

Children with ASD experience deficits in the social and communication areas of a) social-emotional reciprocity, b) nonverbal communication (e.g., eye contact), and c) developing, maintaining, and understanding relationships (e.g., making friends) [1]. Maintaining and generalizing the skills they learn is another challenge faced by learners with ASD [2]. The communication deficits among children with ASD are usually addressed through structured and/or naturalistic interventions delivered by qualified professionals such as behavior analysts, speech-language pathologists, and special educators. Fortunately, delivering those interventions is not limited to professionals. Parents of children with ASD could deliver interventions if they received proper and sufficient training. Previous studies indicated both children with ASD and parents benefit from parental involvement in intervention sessions. Those studies found parents can successfully teach verbal operants such as mands/requests [3] and promote interaction styles with their children [4]. In addition, parents involved in intervention reported improved depression [4] and other psychological symptoms such as anxiety and insomnia [5]. Also, involving parents in interventions is important for generalization and the overall success [6–8].

The gap between children with ASD who need interventions and availability of interventionists is related to the increased prevalence of this disorder over the past two decades [9, 10]. Unfortunately, many families are placed on waitlists due to increased demand and shortage in interventionists [11]. Placing families and children on waitlists

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results in developing stress and concerns such as uncertainty and loosing time in their children's development [12]. Also, accessing services becomes more difficult when families live in rural communities [13]. Luckily, recent advances in technology have offered cost-effective option to provide services to children with ASD and their families known as telehealth. Telehealth enables interventionists to provide services remotely to parents and children with ASD who live in rural and underserved areas. Research shows coaching parents through videoconferencing technology was helpful in improving their verbal responsiveness to their children's communicative acts [14], increasing children's functional verbalizations [15], and increasing overall procedural fidelity. Procedural fidelity is the degree to which the intervention was implemented as planned. Obtaining low procedural fidelity in experimental research makes it difficult to conclude the intervention is responsible for behavior change [16]. Measuring procedural fidelity is specifically important in interventions mediated by parents due to their lack of experience in delivering interventions tailored for children with ASD [17].

Due to the importance of parental involvement and viability of telehealth, this review aimed to synthesize the existing literature about training parents of children with ASD via telehealth to implement communication interventions. Thus far, researchers have reviewed the studies on using telehealth to train parents of children with ASD. Those reviews were either limited to behavior-analytic interventions [18] or children up to 6 [19] and 11 years old [20]. However, the current review is intended to extend the previous reviews by reviewing studies in which telehealth was used to train parents on using both behavior- and non-behavior analytic communication interventions to children with ASD ranging in age from 0 to 18 years old. Specifically, it aimed to answer the following questions: 1) What methods were used to train parents on implementation? 2) Who coached the parents? 3) Did parents implement the interventions with reasonable fidelity? 4) What is the efficacy of remote parent training on acquisition of communicative behaviors among children with ASD? 5) What are the outcomes of generalization and maintenance? and 6) Is the social validity of target behaviors, interventions, and outcomes supported?

Search Process

A four-step process (see Fig. 1) was followed to locate and review studies that examined the efficacy of training parents of children with ASD via telehealth to implement interventions. The first step is *identification*. This step included conducting a combined electronic search using the following keywords: *autism* or *ASD* or *autism spectrum disorder* or *asperger's* or *asperger's syndrome* or *autistic disorder* or *aspergers* AND *parent training* or *parent education* or *parent coaching* or *parent-implemented* or *parent-mediated* AND *speech* or *language* or *communication* or *verbal* AND *telehealth* or *telemedicine* or *telemonitoring* or *telepractice* or *telenursing* or *telecare* or *virtual*. The databases used were: Academic Search Premier, Education Full Text, ERIC, and PsychINFO. The following filters were applied in the combined search: English and scholarly (peer-reviewed) journals. After removing duplicates, this search resulted in 27 articles. The second step *screened* the 27 articles to verify their relevance to the topic of the research by reading the title and abstract of each record. This step resulted in excluding five records.

The third step screened the 22 records in full to determine the *eligibility* based on preset criteria. Records were considered eligible if they met the following inclusion criteria: 1) published in English, 2) experimental research, 3) included participants with ASD, 4) examined the efficacy of parent training to implement training via telehealth, and

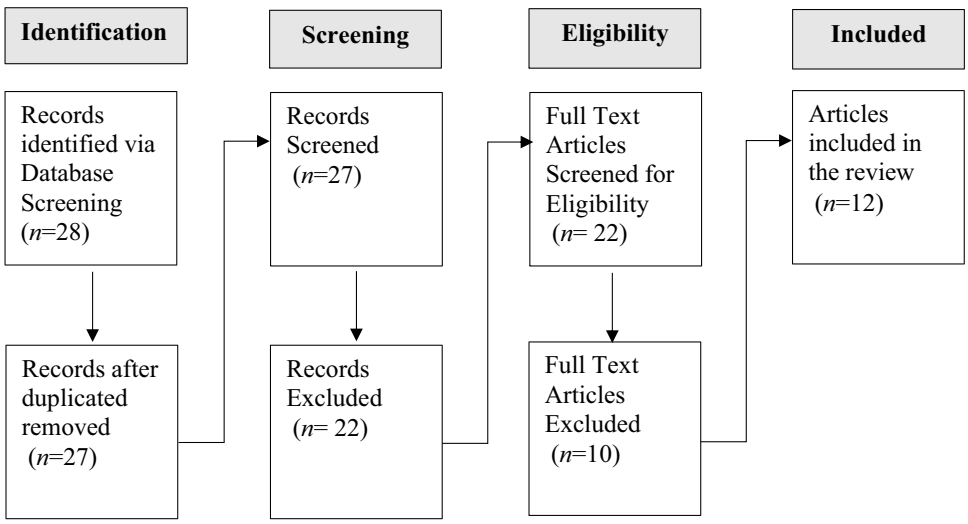

Fig. 1 Four-step search process

5) participants ranged from zero to 18 years. The records excluded studies with participants other than autism and studies with content unrelated to speech, language, communication, and verbal behavior. In addition, literature reviews, brief reports were not included in the records.

Results

The search process described in the previous section resulted in 12 records being included in this review. The last step was reviewing and summarizing the final 12 records in one matrix (see Table 1). The matrix included the following information about each record: a) characteristics of participants, b) modality of training, c) research design, d) dependent variables, e) characteristics of coaches, f) fidelity, g) efficacy, h) generalization, i) maintenance, and j) social validity.

Research Designs

Different research designs have been used in the reviewed studies. Most research teams ($n = 8$, 66.67%) used solely variations of single subject research design (SSRD). One research team [21] used both SSRD and randomized controlled trial (RCT). The variations of SSRD included time-series A-B design [22], nonconcurrent multiple probe design across subjects [23••], multiple-probe across subjects [24], multielement design [11, 21, 25], ABAB combined with multiple-probe across contexts/requests [11], multiple baseline across subjects combined with reversal design [21] and multiple-baseline across strategies [26], behaviors [26], subjects [27], and dyads [15]. Group designs included pretest–posttest design [28•] and RCT [9, 21, 29]. The results are presented below in order of the research questions that helped guide this review.

Child and Parent Characteristics

The studies identified in this review included more than 146 children with ASD, two at high risk for ASD, one with Down Syndrome, and one with Rett Syndrome. One research team [28•] mentioned the number of parents rather than children. Hence, the exact total number of participating children with ASD is unknown. The children ranged in age from 18 months to 18 years. Other demographic information such as gender and ethnicity of children was not reported in all studies. The reported gender of child participants with ASD, however, was 102 males and 34 females. Those numbers are mirroring the gender ratio of three males for every one female with ASD [30]. The majority of child participants were White/Caucasian/Non-Hispanic. The percentage of children from minority groups varied among studies. The percentage ranged from 0% [26] to 100% [23••]. Two research teams [11, 22] did not report the ethnicity of children, whereas Tsami et al. [25] reported the country of residence rather than the ethnicity.

The reviewed studies included more than 130 parents/families. Parents in some studies [28•] dropped out at some point during the study for different reasons. Ages of parents were reported in five studies. The parents in those studies ranged in age from 20 to above 55 years old. The languages participating parents speak included English, Spanish, Arabic, Turkish, Russian, and Greek. The qualifications of participating parents ranged from less than college degree (e.g., high school) to doctorate. Household income was reported in four studies only [15, 26, 27, 29]. At least 61% of participating families in those studies earned more than $75,000 a year. Ingersoll et al. [9] reported 19 out of 27 participating parents lived in underserved areas, whereas all participating families in the study of Vismara et al. [15] were from the middle-class. Authors of five studies only (42%) described the employment status of participating parents. Around 62% of them were either part- or full-time employed.

Methods of Parent Training

To answer the first research question, the studies identified in this review (see Table 1) were categorized in terms of method of parent training/coaching. The methods were coded into two themes: 1) Single modality, and 2) Multi-modality studies. Single modality studies are those in which synchronous telehealth was the only format the researchers used to deliver parent training, whereas multi-modality studies included a combination of formats such as synchronous/asynchronous or in-person/remote.

Single modality studies [11, 21, 25, 27] addressed real-time coaching only. During real-time coaching, coaches gave instructions to parents while working with their children. The coaches used materials such as computers/tablet devices, webcams, headphones, and/or telehealth software. Multiple-modality studies addressed multicomponent telehealth packages or compared two modalities with each other (e.g., remote vs in-person coaching). Multicomponent telehealth packages included a combination of remote and in-person coaching [26], viewing videotaped therapy sessions and visual supports (i.e., outlines) followed by brief real-time coaching [23••], synchronous (e.g., verbal instructions, role-play, feedback) and asynchronous (i.e., cheat sheet) training followed by synchronous coaching in which feedback on implementation was given to parents based on pre-recorded videos [24], real-time coaching followed by viewing website modules [15, 29], and viewing blended (synchronous and asynchronous) webinar followed by coaching sessions in which feedback on implementation was given to parents based on pre-recorded videos [28•]. Comparative studies included comparing therapist-assisted

Table 1 Summary of reviewed studies

Study	Participant Characteristics	Modality of Training	Research Design	Dependent Variable(s)	Coach(es)	Fidelity	Efficacy	Generalization	Maintenance	Social Validity
Baharav & Reiser (2010)	Children: 2 with ASD, 4 yrs; 6 months and 5 yrs; 2 months Parents: No info	Multi-modality	Single subject time-series (A-B) design	Raw scores on VABS-II and MCDI, number and frequency of initiations and responses, number of opportunities the clinician and parents offered to their children to interact, and time spent in reciprocal interactions	SLP	___	One child maintained the social and communicative gains when switched to hybrid model. The other child continued to increase those gains. Number of opportunities parents offered for their children to interact increased when intervention was delivered in a hybrid model	__	__	Generally positive (some challenges experienced)
Flippin & Clapham (2021)	Child: 5 yrs; 6 months, M, ASD, White Parent: Father, White, 40 yrs old	Multi-modality	MBD across strategies & MBD across behaviors	The proportion of parents' application of 3 strategies: Commenting, directing, responsive object play) Collateral effect: Frequency of child-initiated single words	Researcher	Reported IOA for parent fidelity rather than fidelity scores	The father learned to use two of the three, targeted responsive strategies. The child showed a slight increase in use of spontaneous single words	__	Father maintained use of the two strategies at 8-week follow-up. Child produced one spontaneous word during maintenance session	Positive

Table 1 (continued)

Study	Participant Characteristics	Modality of Training	Research Design	Dependent Variable(s)	Coach(es)	Fidelity	Efficacy	Generalization	Maintenance	Social Validity
Gevarter et al. (2022)	Children: 3 Latinx M (1 with ASD, 2 at high risk), 22–33 months old Parents: 2 M, 1 F, Latinx, 1 bilingual (Spanish/English), 2 monolingual (English), 20–28 yrs old	Multi-modality	Nonconcurrent MPD	1) Number of completed communication turns between parents and children and number of children's independent responses 2) 2) Parent's usage of strategies	Researcher and developmental specialists	Fidelity measured for researcher only. The fidelity was 100% for all triads and in all sessions	Communicative turns were variable but all above baseline. Responses were higher than baseline	Communicative turns continued to increase when developmental specialists were absent	—	Positive
Ingersoll et al. (2016)	Children: 8 females and 19 males, 19 to 73 months old, 22% from minority groups Parents: 28 families (1 dropped out later)	Multi-modality	RCT	Parents: Procedural fidelity, self-efficacy, and stress Children: language targets (e.g., single words) and scores of MCDI and VABS-II	Master's level therapists	Fidelity improved in both groups	Parents in both groups enhanced fidelity. Higher gains and 100% program completion rate among parents in therapist-assisted group. Language scores enhanced in both groups. Socialization scores on VABS-II improved in therapist-assisted group only	—	Significant difference in language targets for children in therapist-assisted group at 3-month follow-up. The difference was insignificant in self-directed group	—

Table 1 (continued)

Study	Participant Characteristics	Modality of Training	Research Design	Dependent Variable(s)	Coach(es)	Fidelity	Efficacy	Generalization	Maintenance	Social Validity
Lindgren et al. (2020)	Children: 56, 21 to 84 months old, ASD, severe ID to above average IQ 47 males and 9 females, 10% of from minority groups	Single Modality	SSRD & RCT	Problem behaviors, number of tasks completed, and mands	Behavioral consultants	___	Significant reduction in problem behaviors and significant increase in mands and number of tasks completed	__	Behavioral outcomes maintained at 6-month follow-up Maintenance of mands not reported	Positive
Pierson et al. (2021)	Children: 3 M (1 Hispanic/Caucasian, 1 Caucasian, 1 not reported) with ASD 5 yrs to 7 yrs; 3 months, 1 M Caucasian with DS, 6 yrs; 1 month Parents: 4 F & 1 M, 34–50 years old	Multi-modality	MPD across subjects	Parent: Implementation of MDR procedures Children: Number of questions answered correctly	A doctoral student and a licensed SLP	Procedural integrity ranged from 89 to 100%	Parents: No functional relationship determined because of variability Children: A small change in questions answered correctly	Generalization data highly variable and overlapped with baseline	Mixed	Generally positive (some challenges experienced in behaviors and procedure)
Rooks-Ellis et al. (2020)	Children: 10 with ASD, Mean age = 29.3 months, 6 M, 4 F, 1 Hispanic, 1 American Indian or Alaska Native 8 Caucasian Parents: 1 M, 9 F, 25–55 + yrs old	Single Modality	MBD across subjects	Parents: Fidelity Children: ASD symptomatology as measured by AIM	Certified P-ESDM provider	Fidelity of parent implementation increased after receiving training via telehealth	Parents: Fidelity increased Children: Significant change in AIM scores	Positive (implementing the procedure without coaching)	Positive (parent fidelity maintained at 2-week follow-up)	Positive

Table 1 (continued)

Study	Participant Characteristics	Modality of Training	Research Design	Dependent Variable(s)	Coach(es)	Fidelity	Efficacy	Generalization	Maintenance	Social Validity
Simacek et al. (2017)	Children: 2 F with ASD & 1 F with RS, 3.5 to 4 yrs old Parents: 2 M & 3 F	Single Modality	MED and a combination of ABAB and MPD across contexts	1) Frequency of target behaviors (AAC requests) for 2 children and percentage of intervals with target behaviors for one child 2) 2) Idiosyncratic responses (e.g., reaching) and AAC requests	Interventionist	Average fidelity ranged from 93 to 96%	Two children acquired multiple target AAC responses and one participant acquired single AAC response. All children decreased idiosyncratic responses	Acquisition of responses occurred across the three contexts	__	Positive
Tsami et al. (2019)	Children: 12 with ASD, 3–13 yrs, 8 M, 4 F Parents: 12 F & 1 M, 29–43 yrs old	Single Modality	MED & MBD	1)Percentage of trials with independent mands 2) Percentage of intervals with problems behaviors (8 participants) or responses per minute (4 participants)	Therapists	Average fidelity ranged 84 to 100%	Effective in teaching independent mands and reducing problem behaviors for all participants	Escape-maintained behavior remained zero when brother of one participant was present	__	Positive
Ura et al. (2021)	Children: 2–18 yrs old Parents: 41 parents, Native American (1%), Multiracial (4%), African American (7%), Asian (12%), Hispanic (14%), Caucasian (49%), & unreported race (13%)	Multi-modality	Group pretest–posttest design	Children: ASRS scores	Doctoral-level students	___	Communication scores on ASRS improved significantly	__	__	__

Table 1 (continued)

Study	Participant Characteristics	Modality of Training	Research Design	Dependent Variable(s)	Coach(es)	Fidelity	Efficacy	Generalization	Maintenance	Social Validity
Vismara et al. (2013)	Children: 8 with ASD, 18 to 45 months, 1 Latinx 1 Hispanic, & 6 Caucasian Parents: 7 F & 1 M	Multi-modality	MBD across dyads	Parents: 1) Scores on satisfaction survey, scores on fidelity tool, parent engagement style as measured by MBRS, 2) Parental usage of website Child: 1) Functional verbalizations, 2) Nonverbal joint attention initiations	Coaches were one of the authors and a therapist qualified to deliver ESDM	All parents improved fidelity, but fidelity criterion was met by most but not all parents	Most parents learned how to use ESDM 3 significant correlations: 1) Between intervention usage and parent engagement style, 2) Between children's verbalizations and their parents' usage of intervention strategies and their engagement styles, and 3) Between children's verbalizations, parents' interventional skills, and engagement style	—	Most parents-maintained usage of ESDM at 3-month follow-up	Positive

Table 1 (continued)

Study	Participant Characteristics	Modality of Training	Research Design	Dependent Variable(s)	Coach(es)	Fidelity	Efficacy	Generalization	Maintenance	Social Validity
Vismara et al. (2018)	Children: 17 M, 7 F, 20 non-Hispanic, 4 Hispanic, 18 to 48 months Parent: 19 F, 5 M, 2 high-school graduates, 4 attended some college, 9 college graduates, and 9 graduate degree holders	Multi-modality	RCT	Parents: 1) Scores on P-ESDM fidelity tool, 2) Program website usage, and 3) Program satisfaction Children: Functional verbalizations, imitative functional play actions, and independent nonverbal joint attention behavior	Coaches were 2 investigators and a therapist. All certified in ESDM	Parents in P-ESDM group showed higher fidelity	Functional relationship could not be determined because the difference between control and treatment groups was consistent across all phases of the study	—	At 12-week follow-up, parents in P-ESDM showed higher fidelity while no change was observed in control group	Positive

AAC Augmentative and Alternative Communication, *AIM* Autism Impact Measure (AIM; [37]), *ASRS* Autism Spectrum Rating Scales (ASRS; [35]), *ASD* Autism Spectrum Disorder, *DS* Down Syndrome, *ESDM* Early Start Denver Model, *F* Female, *ID* Intellectual Disability, *IOA* Interobserver Agreement, *IQ* Intelligence Quotient, *M* Male, *MBD* Multiple Baseline Design, *MBRS* Maternal Behavior Rating Scale (MBRS; [38]), *MCDI* MacArthur-Bates Communicative Development Inventory (MCDI; [39]), *MDR* Modified Dialogic reading, *MED* Multielement Design, *MPD* Multiple Probe Design, *P-ESDM* Parent-Implemented Early Start Denver Model, *RCT* Randomized Controlled Trial, *RS* Rett Syndrome, *SLP* Speech-Language Pathologist, *SSRD* Single Subject Research Design, *VABS-II* Vineland Adaptive Behavior Scales, Second Edition (VABS-II; [40])

and self-directed intervention [9] and clinician-delivered with hybrid (i.e., clinician- and parent-delivered) intervention [22].

Parent Coaches

Parents who participated in the reviewed studies were coached/trained by professionals varying in training, licensure, experience, and qualifications. Parents in some studies [15, 23••, 26, 29] were coached directly by the researcher. Two of those research teams [15, 29] involved therapists who were certified in Early Start Denver Model (i.e., ESDM; [31]). Parents in the other studies were coached by a researcher and developmental specialists [23••], behavioral consultants [21], master's-level therapists [9, 25], doctoral-level therapist [25], speech-language pathologists [22, 24], a certified Parent-Implemented Early Start Denver Model (P-ESDM; [32]) provider [27], and doctoral students seeking certification in applied behavior analysis (i.e., [28•]). Simacek et al. [11] mentioned parents were coached by interventionists without describing their qualifications and/or licensure.

Fidelity of Implementation

Parent procedural fidelity was measured in 9 studies (75%). Eight of these studies reported reasonable parental implementation fidelity, whereas Flippin & Clapham [26] reported interobserver agreement (IOA) for parent fidelity rather than fidelity scores. Procedural fidelity was not necessarily measured on all intervention sessions. For instance, Tsami et al. [25] measured procedural fidelity on no more than 30% of sessions. Interestingly, fidelity was not measured in two studies in which group research design was used [21, 28•]. This was possibly due to large number of participating parents.

Efficacy of Remote Parent Training on Acquisition of Communicative Behaviors Among Children with ASD

All single modality studies indicated real-time coaching alone was effective in increasing mands [21, 25], improving ASD symptomatology (e.g., communication, social reciprocity; [27]), increasing usage of AAC devices to request access to reinforcers [11], and reducing idiosyncratic responses such as leading [11].

Most, but not all, studies on multicomponent telehealth packages indicated parent-mediated interventions were effective in increasing spontaneous single words [26], rates of children's independent communication responses [23••], functional verbalizations [15], and social communication skills [28•]. Two research teams [24, 29], however, could not determine the impact of intervention. Some research teams such as Ura et al. [28•] used parent-reported scales instead of direct measurement of children's communication responses and one research team evaluated improvement in child' communication as a collateral effect [26]. Also, no research team conducted a component analysis to determine which component of the telehealth coaching package was the most or the least needed to coach parents effectively.

The comparative study of Ingersoll et al. [9] indicated children's language gains were marginally higher among children who received therapist-assisted intervention than those who received self-directed intervention. This finding suggests parents were able to improve their children's language without receiving direct coaching and supervision from clinicians. Moreover, it is unknown which component of self-directed intervention was the most helpful in enabling parents to implement the intervention effectively. It is possible that some components (e.g., homework) were more helpful than others (e.g., self-check). The other comparative study [22] indicated the hybrid model in which clinician-delivered sessions were followed by parent-mediated sessions had an additive effect to the traditional model (i.e., clinician-delivered only). This additive effect, however, was not observed in the other participant. The results of this study must be interpreted with caution due to the small sample size ($n=2$) and its experimental design (i.e., time-series A-B design).

Outcomes of Generalization and Maintenance

Generality of change in child behavior was assessed in one third ($n=4$) of studies. Authors of those studies assessed generality across novel stimuli [24], contexts [11], non-training family members [25], and when coaches were not present [23••]. Rooks-Ellis et al. [27] assessed generalization of parent fidelity rather than children's behavior. Generalization outcomes in those studies were generally positive except Pierson et al. [24] as intervention data were highly variable and overlapped with baseline. It should be noted generalization was assessed for one out of 12 participants in the study of Tsami et al. [25]. Thus, generalization outcomes among other participants remain unknown.

Generality of change in behavior across time (i.e., maintenance) was assessed in more than half ($n=7$, 58.3%) of the reviewed studies. Some studies (e.g., [27]) assessed maintenance of parent fidelity rather than children's behavior. Maintenance probes were taken one week [24] to six months [21] following intervention. It is important to note Lindgren et al. [21] reported reduction in problem behaviors over 6 months but did not report maintenance data of communication skills (i.e., mands). Also, the researchers could not contact all participating families at 6-month follow-up. Hence, it is unknown if maintenance outcomes were positive

among all participating children. With the exception of Pierson et al. [24] in which maintenance outcomes were mixed, outcomes of maintenance in the reviewed studies were generally positive.

Social Validity

Social validity from parents' perspective was assessed in the majority of reviewed studies ($n = 10$, 83.3%). All research teams assessed the three facets of social validation: a) acceptability of treatment package, b) social significance of target behaviors, and c) importance of intervention outcomes [33]. Additionally, not all studies assessed acceptability in terms of coaching. For example, Lindgren et al. [21] asked parents about the extent to which the treatment rather than the coaching via telehealth was acceptable. All studies in which social validity was assessed reported overall reasonable parent acceptability. Some parents reported technical difficulties during telehealth coaching sessions (e.g., [22]) and challenges with implementing intervention and managing their children's problem behaviors (e.g., [24]).

Discussion

The present review aimed to synthesize the existing literature about training parents of children with ASD via telehealth to implement communication interventions. Overall, the reviewed studies indicate coaches with varying levels of qualifications and experiences coached parents via real-time coaching only and/or multi-modality telehealth. Most research teams reported reasonable fidelity. The efficacy of parent-mediated intervention was evidenced in the majority of reviewed studies, whereas evidence of generalization and maintenance was limited. The participating parents were generally satisfied. However, some technical (e.g., [22]) and behavioral (e.g., [24]) challenges were reported.

The first aim of the present review was to examine the methods used to train parents on implementation. Single and multi-modality telehealth were both generally efficacious in coaching parents and socially acceptable. As mentioned earlier, all single modality studies were efficacious in increasing communicative responses among children with ASD, whereas most multi-modality studies showed efficacy in teaching communicative responses. Due to the relatively small number of studies included in this review, the superiority of real-time coaching over multi-modality telehealth in coaching parents on implementing communication interventions cannot be determined. Thus, further studies, systematic reviews, and even meta-analyses are needed to compare the efficacy of these two modalities.

The second aim of this review was to examine the qualifications and experiences of professionals who coached the parents. Apparently, coaches in the reviewed studies were generally able to coach parents successfully regardless of their experience, licensure, and degree. While coaches varied in their qualifications, all of them were experienced in their fields (e.g., behavior analysis, speech-language therapy). Accordingly, the extent to which entry-level therapists are able to coach parents efficiently is unknown. Furthermore, the best strategy to coach coaches is unknown as not all research teams described how coaches were coached. Researchers may examine the efficacy and acceptability of different training approaches. They may also examine the efficacy of different formats (i.e., in-person, remote, hybrid) when coaching coaches. Additionally, it would be beneficial to examine the efficacy of group versus one-on-one coaching.

The third aim of the current review was to examine parent procedural fidelity. As mentioned earlier, most research teams reported reasonable parent fidelity. However, it is unknown if the participating parents implemented the interventions as planned in the two studies in which group-research design was used. Lack of fidelity data limits the ability to draw confident conclusions about the role of intervention in changing the target behavior. It is also important to measure procedural fidelity continually to determine if treatment drift has occurred. Treatment drift refers to the change in how intervention is delivered over time. Monitoring treatment drift is especially important when intervention is mediated by parents as they usually have little or no experience in intervention.

There are several possibilities for the reasonable fidelity outcomes obtained in most reviewed studies. It is possible the previous exposure to interventions have enhanced the fidelity of implementation among some parents. Some parents were possibly exposed to the addressed interventions or related ones directly or indirectly prior to participating in the studies. Direct exposure might involve delivering one-on-one intervention and receiving hands-on training, whereas indirect exposure might involve observing therapists delivering the interventions to their children or using resources such as books, websites, and videos to address interventions similar to those used in research. For example, Pierson et al. [24] recruited parents who worked in teaching, behavioral, and occupational therapy. Hence, the experiences those parents obtained prior to participating in the study have possibly played a role in maintaining high fidelity (range 89 to 100%). Unfortunately, the experiences and the trainings parents received prior to participating in other studies were not reported in most studies. Thus, the claim that previous exposure to intervention plays a role in enhancing fidelity cannot be made depending on the existing information. Being experienced in intervention is not the only possible factor in enhancing fidelity. The participating parents were generally able to implement the interventions

as planned regardless of their experience, age, gender, culture, education, employment status, and profession. There are other possible factors that influence parental fidelity of implementation. For instance, Wakeford [34] used multiple regression and correlational analyses to predict the factors that influence parental fidelity of implementation. Those factors are family's socioeconomic status, parenting style, the consistency between parenting style and intervention, and interventionist adherence fidelity.

It is worth noting, a component analysis was not conducted in any study in which multicomponent telehealth packages were used. A component analysis could have helped with determining the necessary components of the telehealth treatment package(s) to increase parent fidelity of implementation. For example, Gevarter et al. [23••] could have coached parents without visual supports then introduced them at a later point of time to determine if they were necessary to increase parent fidelity of implementation.

The fourth aim of this review was to examine the efficacy of remote parent training on acquisition of communicative behaviors among children. While most studies indicated training parents via telehealth was efficacious in improving communication among children with ASD, those results must be interpreted with caution for three reasons. First, not all research teams measured the target communicative skills directly. For example, some research teams (e.g., [28•]) used indirect methods such as Autism Spectrum Rating Scales (ASRS; [35]) to measure improvement in communication. Also, one research team [26] assessed improvement in child's communication as a collateral effect. Direct measurement is more valid than indirect measurement because the latter requires an inference with its relation to the target behavior [16]. Second, some research teams (e.g. [21],) addressed specific communicative behavior (e.g., mands). Accordingly, the generality of effect across other communicative behaviors (e.g., making comments) remains unknown. Third, some studies (e.g., [26]) yielded modest increase in children's communication. Further investigation is needed to determine the possibilities for the positive efficacy outcomes. First, dosage of coaching and intervention. It is possible most studies yielded positive outcomes in terms of communication because parents received sufficient coaching and children received sufficient intervention in terms of duration and frequency of sessions. However, the assumption parents and children received sufficient coaching and intervention requires empirical evidence. One empirical method to determine the sufficient dosage of intervention and coaching is parametric analysis. Using parametric analysis, researchers may manipulate one value of the independent variable (e.g., duration) at a time to determine the effect of increased or decreased value on the dependent variable. Second, some child characteristics have possibly facilitated the positive outcomes of interventions. These factors are, but not limited to, age, cognitive performance, preexisting communicative skills, and ASD severity. Third, implementing the intervention with high fidelity has possibly contributed to the positive outcomes. It is critical to consider implementing the intervention with high fidelity does not necessarily result in positive intervention outcomes. For instance, the participating parents in the study of Pierson et al. [24] implemented the intervention with a high fidelity (range 89 to 100%). However, most participating children showed no change in responding except one child who demonstrated a small change. Therefore, fidelity is not the only factor that increases efficacy of intervention.

The fifth aim of the current review was to examine the outcomes of generalization and maintenance. Due to limited generalization and maintenance data, the extent to which most children were able to generalize and maintain behavior change after receiving parent-mediated intervention is unknown. Researchers should compare the generalization and maintenance conditions in parent-delivered and clinician-delivered interventions. It is possible generalization and maintenance outcomes differ when intervention is delivered by different providers. For example, DeVeney et al. [36] suggested parent-delivered intervention for late talkers has the potential to yield better outcomes than clinician-delivered intervention. This assumption was based on results of 8 studies with a total of 175 children. Thus, additional data from children with ASD and their families are needed.

The sixth aim of this review was to examine the outcomes of social validation in terms of target behaviors, interventions, and outcomes. While obtaining parents' perspectives about treatment packages and coaching is important, it is equally important to assess acceptability from the perspective of intervention recipients (i.e., the children). None of the reviewed studies, however, included validation of intervention from children's perspective. It would be more helpful to compare acceptability of treatment from children's perspectives when delivered by their parents and other caregivers (e.g., therapists).

Implications for Policymaking and Practice

Based on current and previous reviews (e.g., [18–20]), telehealth is a viable option to train parents and other caregivers of children with ASD on delivering interventions to address communication, problem behaviors, and other skills. Therefore, policymakers may develop and update the existing policies related to telehealth on an ongoing basis to ensure parents are receiving an effective, confidential, and affordable training. Also, governments and private funders may fund programs that aim to train and coach parents of children with ASD via telehealth. Families who live in rural areas and those who live in poverty should be prioritized as

they have limited access to traditional face-to-face service providers.

Practitioners who train parents of children with ASD and other disabilities via telehealth are highly encouraged to adhere to and stay updated on the policies to regulate this practice. There are policies and guidelines issued by the licensing bodies (e.g., Department of Health) and the professional associations such as American Speech-Language-Hearing Association (see [41]).

Limitations and Future Directions

The reviewed literature encompasses some limitations. First, parents were mainly trained/coached by professionals experienced and/or certified in their fields. Future researchers might examine parent fidelity of implementation when coached by entry-level therapists. Second, it is unknown which component of multi-component intervention packages was the most/least needed to achieve the desirable outcomes. Consequently, researchers are encouraged to conduct add-in or drop-out component analyses in future. Third, it is unknown if outcomes differ when intervention is mediated by different individuals. Future studies may compare efficacy, generality, and maintenance of behavior change when intervention is delivered by different implementers (e.g., parents versus interventionists). Fourth, the participating children were not involved in any social validity assessment. Researchers might involve children in social validity evaluations and comparing their acceptability of intervention when delivered by different implementers (e.g., parents versus interventionists). Fifth, the number of participating children and parents was fewer than 10 subjects in some studies (e.g., [22, 23••, 26]). For instance, the study of Flippin and Clapham [26] included one child and one parent only. Both internal and external validity can be compromised when the sample size is very small [42]. Hence, larger samples are needed in the future original or replication studies. Sixth, not all reviewed studies included a control group. Therefore, future researchers might consider control groups to gain a better understanding of the impact of variables they cannot fully eliminate from their experiments [43]. Seventh, one research team (i.e., [28•]) used parent-reported scale to measure improvement in communication skills rather than direct observation. Future researchers must be cautious when relying solely on self-reported measures due to the risk of response bias [44].

Conclusion

This narrative review found different telehealth modalities were successful in coaching parents on implementing communication interventions for their children with ASD. In addition, we found most parent-implemented interventions were effective in increasing children's communication skills such as mands, spontaneous verbalizations, and AAC requests. While generalization and maintenance data are limited, most studies indicated positive social validation outcomes from the perspectives of the parents.

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Declarations

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Competing Interests The authors declare no competing interests.

Authenticity This manuscript is authentic. It is based on a dissertation completed by the first author who was supervised by the second author. This manuscript has not been submitted to another journal for consideration.

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- • Of importance
- •• Of major importance

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